

**THE
ECONOMICS OF RIVER
BASIN DEVELOPMENT
IN
INDIA**

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**KARUNA MOY MUKERJI
AND
K. JOHN MAMMEN**

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By

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PREFACE

The present volume discusses some aspects of economic analysis involved in the planning and execution of multi-purpose river basin development. As an integral part of her comprehensive, five-year national economic plans, India has carried out in recent years a number of gigantic river valley projects. Large sums of money and materials have been spent on implementing them. Yet larger capital investments have been sanctioned and allocated toward investigation, organization and fulfilment of a still greater number of small, medium and large river training projects. India's overall progress and experiences in this direction afford an opportunity to attempt, as in this book, to examine the need, the economic criteria, and the expected results of investments in an integrated river basin development programme. In any country, specially so in a capital-poor so-called underdeveloped country there is, moreover, the imperative need not only of establishing priorities among a number of investment projects, but at the same time to evolve clear-cut methods of securing both reimbursable and non-reimbursable finances for necessary capital expenditure, and reasonable principles of reimbursement of the capital so invested. Therefore, we have also discussed the different ways of financing river basin* development programmes and the problems of reimbursement. As a corollary, we have dealt at some length with the procedure and principles adopted in determining irrigation rates, betterment levies, and hydro-power prices payable by farmers and consumers in general.

Since the economic appraisal of the different branches of a multi-purpose river project as well as the evaluation of the project as a whole, and, also, the determination of the rates or prices of the products or services made available by them depend on a rational cost allocation, we have analysed the principles of allocation of joint-costs involved in such project works. An attempt has likewise been made to assess the benefits and costs of flood control by river training, and to discuss the importance and complexities of different types of organization entrusted with the task of co-ordination and unified administration of integrated river basin development. How far the right economic and administrative principles, methods, and procedures have been adopted and followed in India, and with what results — these and similar other questions are dealt with in a brief compass in this book.

In preparing this volume, the authors have collaborated throughout. Some of the materials contained in it had, however, been collected by one of the authors (Mukerji) before 1954; the rest that was assembled between 1955 and 1959 was gathered partly by him and largely by the co-author (Mammen) during his stay as a research worker at E.R.B.

Santiniketan, between 1955 and 1957. The chapters contributed by the latter were revised, and some of them re-written, and the book as a whole edited, by Mukherji who, apart from contributing a number of chapters, undertook the task of writing the prologue.

The authors have acknowledged their debt to writers and their publishers by mentioning the reference sources at footnotes to this volume and in the bibliography appended. But mention should be made specifically here that in Chapter IX the authors have drawn heavily from the U.N. publication, titled *Rural Electrification*. For Chapter III on "Benefit-Cost Analysis and River Resources Development", they have depended a great deal on S. V. Ciriacy-Wantrup's article, "Benefit-Cost Analysis and Public Resource Development" in the *Journal of Farm Economics*, November, 1955.

Santiniketan,
West Bengal,
December, 1959

K. M. M.
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CONTENTS

CHAPTER	PAGE
PREFACE	v
PROLOGUE	ix
I INTRODUCTION	1
II THE FINANCING OF RIVER PROJECTS	7
III THE BENEFIT-COST ANALYSIS AND RIVER RESOURCES DEVELOPMENT	18
IV THE BENEFIT-COST APPROACH IN INDIA'S RIVER PROJECTS	28
V THE PRINCIPLES OF COST ALLOCATION	33
VI THE PROBLEM OF REIMBURSEMENT	38
VII THE IRRIGATION RATES	42
VIII THE BETTERMENT LEVY	55
IX THE RATES FOR HYDRO-ELECTRIC POWER	77
X THE ECONOMICS OF FLOOD CONTROL	81
XI THE ADMINISTRATION OF RIVER VALLEY PROJECTS	89
XII RETROSPECT AND PROSPECT	102
BIBLIOGRAPHY	110

PROLOGUE

Multi-purpose River Basin Development is a logical step from multi-purpose river control and water resource use, just as multi-purpose river control and water use is a logical step from single-purpose river projects.

Multi-purpose river training approach puts the main emphasis on the use of water for all purposes. On the technical level, the search for two or more uses of water at the same time appears to have been suggested by the fact that the essential techniques involved are the same for the different purposes. On the non-technical level, the concept of multiple use of water resources has originated from the growing awareness that they are limited, and, secondly, from the growing influence which statesmen, financiers, geographers, economists, lawyers, etc. have exerted on engineers who tended to restrict project work to limited purposes.

The basic elements of a sound water policy to ensure an adequate water-supply for the people, prevent waste of water, provide for greater re-use of water, reduce water pollution, provide means for the beneficial use and equitable distribution of available water supplies and take steps to check the destructive forces of water that threaten to injure or destroy land, property and human life.¹

Unified Use of Water and Land Resources

River training work is sometimes wrongly conceived in terms of engineering structures on the main streams. The right approach should, however, be to control and treat whole rivers and watersheds as units. For, water resource development divorced from land management and land resource development is largely meaningless. The multi-purpose use of land are, in fact, closely associated with the multi-purpose uses of water resources. The need, as one writer has remarked, is "not to do less river control, but to do more land control."²

The task of water control through land control and management consists in the two-fold task of managing the upper basin of the river, that is, the headwaters sector of the basin which largely comprises forest lands and grazing lands, on the one hand, and its lower basin, or more properly, the agricultural sector of the watershed comprising primarily the arable lands and, secondarily, some grazing lands, on the other. The manner of land use—forest land, grazing land, and arable land—largely determines the quantity, quality, and the timeliness of water flow. Just as the storage dam built by engineers modifies in distribution of water and regulates stream flow, similarly, land use practices

¹ Harry A. Steele, "The Economics of Water Supply and Control" in *International Journal of Agrarian Affairs*, Vol. II, No. 5, June 1959, p. 411.

² Ward Shepard, *Food or Famine: The Challenge of Erosion*, New York: The Macmillan Co., 1945, p. 144.

including, among other things, the provision for vegetative mulch in the upper soil increase water absorption and retard run-off, and thus regulate the stream flow throughout the year. As one writer picturesquely puts it, "The smallest dam in the world is a blade of grass."¹

Water resource development policy must, therefore, outlive the "concrete-pouring and dam-building stage of emphasis" in river training practices. One American writer has reproved this attitude to be "a characteristic of the American mind."² The crucial point, however, is to keep a proper balance between the proportion of capital investment in mainstream development and that in watershed protection. How imbalanced the proportion may be is illustrated by the American example of the Missouri Basin development where for each dollar spent on the latter, eight dollars are spent on the former.³ The picture is even more discouraging in many other countries including India where although large sums of money have been spent on building structures on the main streams, hardly any comparable programme of investment in watershed control appear to have been authorised. In fact, "our present concentration on the dam and the beneficent power it creates has blurred the picture and kept us from realizing all that is involved in total river use as affecting regional development".

River Basin Development and Regional Planning

Just as a comprehensive land resource development programme coupled with an adequate water resource development effort is suited to the solution of the physical problems of resource conservation, control and use, similarly, it is thought, a unified river basin development programme is suited to the solution of economic and social problems in the region as a unit of socio-economic planning. Where, however, institutional factors are dominant, the river basin may have little relevance for the economic and social problems of a particular geographic area. But the social-economic region may conform closely to the river basin in areas where river transport is of major significance. Usually, however, the physical problems of resource development may be tackled on the basis of smaller drainage basins which are fractions of a larger social-economic region. Conversely, social-economic problems may outstrip the geographical boundaries of a river basin. However, a unified effort is needed both to develop the physical resources of the river basin and to attack the economic and social problems of a river basin or a region.

Benefits of Integrated River Basin Development in Underdeveloped Countries

We may distinguish the types of benefit into (i) direct or primary, (ii) indirect or secondary, and (iii) intangible. The first category in-

¹ Jay Franklin, *Remaking America*, Boston: Houghton Mifflin Co., 1942, p. 106.

² Roy E. Huffman, *Irrigation Development and Public Water Policy*, New York: The Ronald Press Company, 1953, p. 163.

³ Huffman, *op. cit.*

cludes the value of immediate goods and services yielded by the project. The second category consists of the value of induced economic activities resulting from the operation of the project. Intangible benefits are those which do not admit of monetary evaluation.

In any country, particularly in underdeveloped countries, since water resources development works are an integral part of the general problem of land and water conservation policy, the policy objectives involved should be (1) to maintain, and (2) to increase the productive potential of land and water resources to meet both present and future requirements. The task is to maintain the community's current standard of living and to provide for economic growth. If a dynamic view of the needs of economic growth is taken, a country's land and water resources should be so managed, conserved and augmented as to ensure an improved standard of living for a fast growing population in the future, to fulfil the needs of the technological changes, to increase the output per acre, to promote exports to other countries, to provide the basis of rapid industrialization, and so on.

In many underdeveloped countries, so long as the present rate of population increase continues, there will be the urgent need of the expansion of cultivated acreage by means of drainage and irrigation.¹ Increased prospects of reclamation of low-lying areas and of intensive as well as extensive cultivation by increased and timely distribution of water by river basin development will also meet the challenge of rapid industrialization in terms of increased demand for food and agricultural raw materials. Rapid industrialization will, again, demand adequate water supply and pollution control. Moreover, to meet energy consumption more hydro-electric power production will find an expanding market, for unlike in developed countries of the West bulk supply of atomic energy is not likely to be available in underdeveloped countries in the foreseeable future.

In underdeveloped countries, hydro-electric power development through river-training may be related to industrial development, such as, the growth of steel industry, fertilizer plants, minerals and processing industries, etc., within the river basin development area. In this sense, and assuming other factors are favourable,² the role of power development may be said to be a strategic role, provided the potential demand for power and its likely increase in future is correctly estimated. It has been stated that the most pressing obstacle to industrialization in the underdeveloped regions of the ECAFE area is perhaps the shortage of electric energy. An indicator of retarded manufacturing development is said to be the low level of electricity consumption. For example, Japan consumed 10 times more electricity than India in 1955.

¹ At present about 200 million acres of the world's agricultural land, which would otherwise have remained barren, is producing food through controlled irrigation. And yet, nearly three-quarters of the world's population are permanently underfed.

² In fact, however, major limiting factors about industrial expansion are capital, foreign exchange, entrepreneurship and management, skilled labour, and markets.

The close correlation between power and industrial development may permit a little digression. The correlationship is reflected, as in the case of India as a whole, in the estimate that "for every rupee invested in power projects, Rs. 3 have to be invested in industrial development." In Pakistan, "Rs. 7000 must be earmarked for each KW of installed capacity."¹ Looked at from this angle, increased investment in industrial development will require a proportionate investment in hydro-power development through planning and operation of river basin development programmes.

In an 'integrated' programme of economic and social development, an important investment criterion is to take advantage of inter-industries and inter-sectors relationships, i.e., to undertake that type of investment which may lead to a variety of investment in other fields of the economy by creating an "infra-structure" or general basis for the economy as a whole, — assuming that the choice of investments in such like programmes have been determined, as far as possible, from the viewpoint of economic effectiveness as measured in terms of alternative uses of the resources so invested. For instance, the provision of such overhead capital as transport, communication, power, health and educational improvements, etc., tend to lower the cost-functions for a large variety of industries and create a climate for overall industrialization. That this is generally recognized is seen from the considerable weight which Burma, mainland China, Philippines, Pakistan, India and others have recently given in their development plans.

In capital-poor countries, it is, however, a basic fact that investment in overhead capital in the interest of creating "external economies" leaves in the short run less for directly productive investment to take advantage of these economies. Moreover, quick reimbursement and re-investment are difficult to realise. In river basin development projects, however, higher taxable capacity and re-investment possibilities in the shape of sale proceeds from hydro-electric power, irrigation rates, betterment levy, etc., are attainable sooner than in comparable investments in transport, roads, education, health improvement, etc.

Changes in the 'infra-structure' of society, as mentioned previously, will activate many branches of the economy in the river basin development area. Increased economic activities and opportunities will attract inflow of labour, capital, skill, entrepreneurship, etc. River basin development projects, moreover, absorb surplus labour which is not merely employed, but is employed to produce the scarce factor, CAPITAL. Drains, roads, irrigation canals, land reclamation, etc., are wealth-producing projects which create immediate employment opportunities and also broaden the future employment potential. The utilization of previously unexploited land and reduction of disguised unemployment may bring new services of considerable value without a social cost. Indirect benefits also include those relating to welfare, such

¹ V. V. N. Naidu, "Planning in Underdeveloped Countries" in *Indian Economic Journal*, Vol. 1, No. 1, p. 9.

as, saving human lives through flood control,¹ making electricity available to rural population, eradicating malaria through river discharge control, preventing air pollution and improving sanitary conditions through substitution of thermal power stations by hydro-power stations.

The final justification of a river basin programme lies, however, in its dynamic effects in improving the overall living standard of the local people as well as of the immigrants into the basin area.

Diversification of production for exports, saving of foreign currency by producing import-substitutes, thereby giving greater stability to the economy, — these may be secondary effects of river basin development. New investment opportunities that are created by new physical facilities as well as additional incomes, savings and consumer demand, are another example of secondary effects. It is difficult, however, to work out the secondary effects of the initial investment, i.e., the multiplier effects of the original investment in river basin development programmes in underdeveloped countries.

Costs or Capital Expenditure

Large elements of conjecture are involved in cost estimates for any specific river basin development programme, specially so in underdeveloped countries, because of insufficiency of reliable data, limited supporting economic activities, shortage of suitable labour, etc. In fact, collateral investments in transport facilities, housing, training, etc., which are very essential to the success of an integrated river basin project, do not easily lend themselves to accurate cost estimates.

There are, in general, five principal types of capital outlays required for an integrated river basin development project, namely, (1) investment in the works on the main stream and tributaries, (2) contingency reserve to cover the margin of errors in estimates, (3) overhead investments for purposes of the specific river project, (4) secondary investment for making the immediate products available for sale, and (5) compensation payments. We may, however, divide costs into (a) Project costs, (b) Associated costs, (c) Indirect or secondary costs, and (d) Intangible costs. The first type of costs includes those involved in the establishment, maintenance and operation of the project. The second type of costs are those incurred in making the immediate pro-

¹ Direct and indirect losses through floods are particularly heavy in underdeveloped countries of Asia and the Far East. ECAFE estimates that upto two million tons of crops are lost every year through floods in South-East Asia and Far East. In particular years, losses have been stupendous. In 1954, for example, heavy summer rainfall in China (mainland) flooded about 27 million acres, hitting 50 million people directly and rendering 10 million persons refugees. At about the same time, floods in East Pakistan inundated about 11,000 square miles, completely washing away some thirty villages and damaging more than 167,000 houses. (vide *Water and the World Today: Its Use and its Control*, U.N., New York, Sales No. 1956-1-24.). The heavy monsoon of 1959 caused unprecedented floods in West Bengal of Eastern India, submerging many parts of eight out of 14 rural districts of the State, involving not less than 70 deaths and property losses worth more than Rs. 100 crores, in course of a fortnight or so.

ducts or services of the projects available for use or sale. The third category of costs are those induced by the project services, such as, costs of processing the immediate products of the project. Intangible costs are those which are not amenable to monetary estimation.

On the basis of total cost estimates for a project as a whole, including total operation and maintenance costs, total annual costs including depreciation charges may be estimated, against which the estimates of total annual benefits may be set. Unlike in the Soviet Union, interest is computed or charged on project investments in all other countries. Calculations of annual costs and benefits are, however, liable to wide margin of errors; there are no adequate safeguards against imponderables.

Techniques for Economic Appraisal of River Basin Projects

A particular technique of economic evaluation, known as the Cost-Benefit technique, has of late been developed, particularly in the U.S.A. The cost-benefit calculation requires that for a project to be economically justified, its estimated total annual benefits should exceed the estimated total annual costs, including intangibles, and that "an equivalent benefit should be impossible to achieve at a lower cost." The computed benefit-cost ratio is used as the yardstick, i.e., when the ratio is above unity, the project is economically justified. Needless to say, the evaluation is made from the viewpoint of the community as a whole.

The benefit-cost ratio may, however, be vitiated by various shortcomings on both the benefit and cost sides, including inadequacy and unreliability of statistical data. Inaccurate price-wage projections, for example, can substantially distort benefit and cost calculations.¹ Secondly, there is the problem of aggregation or lack of comparability of the benefits which are added together, for instance, irrigation benefits are calculated on the basis of net increase in farm income while power benefits are evaluated on the basis of value or sale price. Thirdly, intangible benefits and costs are incalculable in money terms. Fourthly, the recent tendency to exclude secondary benefits and costs from economic evaluation will make benefit-cost calculations in underdeveloped countries unrealistic, even harmful. Fifthly, again in underdeveloped countries, psycho-social and institutional factors may distort the benefit-cost ratio by resisting, for example, the accrual of expected and estimated benefits from the project. Project benefits may depend to a great extent on inducements that can be offered, for instance, to the farmers. Finally, the benefit-cost technique of economic evaluation, as modified at present, which considers income effects alone, may not suit underdeveloped economies where other effects of projects, such as, distribution effects, balance of payments effects, etc., are sufficiently significant for purposes of making project evaluation and establishing project priorities.

¹ In underdeveloped countries note should be taken of the fact that 'real' costs would be lower because of unused resources, such as, fallow land and underemployed labour.

Despite the limitations of the benefit-cost analysis approach in economic appraisal of projects, certain countries outside of the U.S.A. have applied this technique in evaluating not only river basin development projects as such, but also specific agricultural development projects. In China (Taiwan), this technique has been used in assessing the economic justification for the Shihmen reservoir project. "The height of the dam in this project was determined on the basis of the net benefits which would accrue from different types of permanent structure and of the costs of building and operating them." The optimum height of the dam was reached by calculating the point of maximum net benefits.¹ Japan also uses the technique for selecting large-scale irrigation and drainage projects by this technique. In Pakistan attempts are made to evaluate agricultural projects by this technique. Ceylon also has recently taken steps to adopt this technique in the light of local conditions.²

Other Methods of Economic Evaluation

Where investments in a large river basin development are of considerable national importance, benefit-cost criterion may be replaced by the more elaborate yardstick, namely, input-output analysis. In the Soviet Union, the method based on a comparison between alternative costs is used. "In this case, theoretical annual cost savings are divided by the additional capital investment involved in the alternative method, and the quotient is expressed by the number of years of repayment (without interest on capital)."³

Whatever the type or method of economic evaluation used, it serves to indicate whether a particular river basin project is advisable from the national point of view, and to help make a choice of priorities among different river basin programmes, although, of course, the cost ratios or figures are not of much use in establishing priorities among different uncomparable development projects, as for example, irrigation versus co-operative farming schemes, road building versus reclamation projects, etc. In such circumstances large projects should be limited to less-than-optimum dimensions, so as to be able to finance other projects; and the incremental benefit-cost ratios, for instance, of different developmental programmes to be chosen, should be as nearly equal as possible.

From the preceding analysis it appears that a large element of value judgement is, in fact, involved in the appraisal of the expected benefits in relation to the outlays. The reasons are (1) that benefits tend to be very widely diffused, (2) that benefits are realizable only in the future which is more or less uncertain, (3) that the inter-relationship of component elements involved are complex, (4) that an accurate quantitative evaluation of the inter-related factors is impossible for lack of

¹ *Economic Bulletin for Asia and Far East*, Nov., 1957, pp. 54-55.

² *Op. cit.*, p. 10.

³ *Integrated River Basin Development*, U.N., 1958, New York, Sales No. 58, IIB. 3, p. 22.

adequate statistical data. etc. Direct physical benefits like units of electricity produced, the amount of land irrigated, etc. are capable of being determined, but significant benefits like income increases are difficult to identify.

The economic viability of each scheme must, therefore, be assessed on its own merits in each situation. A scheme which is economically feasible may not, however, be financially feasible, such as, benefits as those of flood control, are not saleable; but profitability test in commercial evaluation from a purely private business angle, should not be applied for judging the merit of a whole project; it is too narrow for a proper evaluation from an overall economic and social point of view, specially in an underdeveloped country, since matters connected with the overall impact of a major river project do not admit of direct calculation in money terms all at once.

Benefit-cost question in Indian River Projects

Much of the criticism of Indian large river valley projects seems to turn generally around the following points: (1) that in technical aspects they are not efficiently executed, resulting often in cracks in dam walls, etc., (2) that time schedules are never observed, (3) that costs almost always exceed the estimates, (4) that resources are not fully utilized and often wasted, (5) that priorities in project selection are very much misplaced, (6) that on an overall basis of planning of the entire economy, balance is not maintained as between quick-yielding short-term investments (river valley projects and other types) of immediate interest and slow-yielding long-term investments. Although, in general, there should be some such balance in project selection and there is the peremptory need to ensure optimum utilization of the available and potential resources and to guard against inefficiency of execution, one should not, however, forget that in large projects like river valley programmes, the long-term benefits, direct and indirect, may be higher than those received from more capital-light quick-fruition types of irrigation investments.

Allocation of Joint-Costs

Some difficult questions are involved in allocating joint-costs in multi-purpose projects. Unless, however, these questions are solved in order to make a proper cost allocation between the different branches of a project, their economic evaluation separately as well as an appraisal of the project as a whole cannot be made. In the absence of the apportionment of joint-costs, it becomes impossible, moreover, to justify the principal variables; to compare and choose among alternative technical schemes, and to plan the project on an overall basis. Cost allocations are no less important in providing a basis for rate making and other purposes.

Single-use or single-purpose cost elements, such as, those involved in installing power generators or navigation locks, etc., are obviously to be charged to the very specific use or purpose. The dam, however,

is a multi-purpose structure where a number of services or products are jointly produced. It is here that cost allocation is really difficult.

Different methods or formulae have been suggested, for, there is, in fact, no single method or formula, for cost allocation. One method is to link costs directly with their benefits in comparable monetary units, that is, in proportion to effects, including secondary effects, produced by each component. Another method is to work out the specific costs for each purpose of a multi-purpose project and the probable costs of single-purpose (hypothetical) alternative projects, to take out the differences between them, and to assign the joint-costs in proportion to these remainders. This method, known as "the justifiable alternative expenditure method," purports to calculate, for example, the cost of hydro-electric power in a multi-purpose river project on the basis of what it would have cost to produce the power in a single-purpose power plant. But what happens in case of cost calculation relating to flood-control where benefit estimates are difficult to make? The merit, however, of the method is that it shows the comparative advantages of integrated multi-purpose programmes over isolated single-purpose projects.

Method of Financing

In highly developed countries, private enterprise often plays an important role in regard to basic investments in a development project, specially so in secondary investments. In underdeveloped countries, however, investments, particularly in river basin type of development, are usually carried out by government agencies. And, in a federation, since river basins extend over the political boundaries of more than one state, both the Federal and State Governments should contribute to the basic investments, the former sharing a greater proportion if the project or programme in question is clearly of national importance.

Apart from the role of the government agencies in financing the main works of a river basin, the question of the utilization of public credit or loans is an important one. Obviously, the use of loans for a self-supporting project is justified. In projects, other than self-financing ones, loans are justified only where the indirect revenues yielded by them, can cushion the strain of repayment on public budget. Fiscal gains from real estate taxes imposed on increased land values resulting from the influx of population into the basin area, provide an example of indirect revenues to the Government. The advisability of using internal and foreign loans and their respective proportion, would depend on local circumstances and on the merit of the specific project involved.

Apart from domestic and foreign credit and ordinary taxation, various forms of revenues, compulsory savings, special taxes and levies, etc. have been used to secure finances for river basin development programmes.

Special revolving funds may be created for financing any specific development project, including a river project. For example, the U.S. Reclamation Fund was started in 1902 by absorbing the revenue from

the sale of public land, and in 1920, 52.2 per cent of all funds collected through the Oil Leasing Act were contributed to it. In Brazil, funds from obligatory savings systems and special taxes covering the entire community, such as, a surcharge on income tax, are allocated to the Bank for Economic Development for financing development programmes of national importance. Funds yielded by a special tax on consumption of electricity are assigned to the National Electricity Commission in Mexico for its electric development plan. In Colombia, local landowners are made to contribute to the financing of the projected integrated development plan of the Cauca River basin at the rate of 0.4 per cent tax on the property value of land and buildings. In the Soviet Union, the financing bodies are the banks which have to provide funds within the time limit set by the State, once the project and cost estimates for hydrotechnical works have been approved.

Problems of Reimbursement

The very first thing to do in connection with reimbursement of public investments in an integrated river basin development programme is to decide definitely as to which investments are reimbursable and which are not, that is, which part of the burden of investments is to be met out of general revenues of the State budget and which part is to be refunded by the particular beneficiaries to the public exchequer. As for the hydro-power branch of multi-purpose river projects, reimbursement difficulties are easily solved. The power sale proceeds should be sufficient to cover operating expenses as well as replacement costs through building up reserves. Even they may contribute toward financing other purposes, such as, irrigation, as it happens in the United States. Agricultural extension services, education, health, sanitation and similar services in the basin area may be financed from the State budget, particularly if the economic situation of the area and the living standard of the people directly benefited are far too depressed relatively to other areas and the population of the country as a whole. Barring such special circumstances, the usual principle is to demand from those most directly benefited a total or partial payment of the public funds so as to spend them on other development projects, specially because public resources are limited, particularly in underdeveloped countries.

In the case of drainage, irrigation, and flood-control, landowners should pay in proportion to the size of their properties, and toward this end, the State should impose fees, special assessments or new regional taxes according to well-defined principles. A general property tax on all lands and an additional special levy on lands directly benefited will serve to catch up indirect and direct beneficiaries respectively. One method is to purchase the lands and assets at current prices before improvement and subsequently re-sell at market prices after improvement. This is feasible where the area is not very thickly populated, and where drainage or irrigation works do actually result in a substantial increase in marketable value of land. In this connection, changes in the land tenure system and pattern of property distribution may be necessary. In the Thal area in Pakistan and in Colombia, where *latifundia* commonly exist in the river basin area, project costs may be re-

funded by beneficiaries in terms of land which may be sold by government to other persons. This process would cause a transfer of property to small holders who may pay by instalments.

As regards reimbursement for irrigation and electric power supply costs, fees should be charged for the services rendered, since the consumption in such cases is measurable. Costs of flood-control works may be reimbursed by a special assessment. A fee for drinking water and a toll for river navigating vessels may be imposed. It may be borne in mind that reimbursement ultimately depends on the reimbursing capacity of the users of land, water and power, which in its turn depends on the extent of improvement in their standard of living.

Problems of Unified Administration

Politically, the problems of river basin development are often inter-state, even international, in character. In a large country of a federal type, unified administration of a large river basin development programme within the framework of democratic action is often very difficult to achieve. What usually happens is that the administration of land and river-development works is twice divided, first among the political units, such as the Centre and the States, and second, among specialised agencies of these political units, such as, departments of irrigation, agriculture, drainage and reclamation, forest, fisheries, etc. The departmental set-up where the programme is carried out by one of the regular departments or ministries is unsuitable for unified administration of an integrated river basin programme. "In nature the function of river and land are one." And this dictates the need of a corresponding unity of managerial direction—a single co-ordinating authority. This authority may be an inter-agency committee of interested Federal and State government agencies, created by administrative action and functioning by mutual agreement. Or, secondly, it may be an autonomous agency created by an inter-state understanding or compact. Or, in the third place, it may be of the corporate valley authority type, such as, T.V.A. or D.V.C.

If continuity is essential to planning, construction and operating phase, it may be provided only by single co-ordinating autonomous agency with fiscal freedom to borrow and use its revenues for construction and operation. Its programme and work-schedules should, however, be clearly defined so as to prevent jurisdictional rivalries with the regular departments.

In the *United States*, the T.V.A., a Corporation controlled by the Federal Government set up in 1933 by T.V.A. Act, has to work co-operatively with and through local and State agencies. This type of organisation has not been adopted in any other river basin in the United States. The inter-agency committee type of authority does not appear to be much in favour in the U.S.A. and there seems to be a growing support for the inter-state-compact method. In 1958, the Congress created two new land and water study commissions, namely, the Texas Land and Water Study Commission (P.L. 85-843) and the

South-East Land and Water Supply Commission (P.L. 85-850), providing a new form of organization for the co-ordination of river basin planning. It may be added that many States of the United States have agencies to administer water-laws but there are few with authority to plan and develop resources.

In the *Soviet Union* gigantic integrated projects like the Volga and Dnieper projects are usually designed and implemented by the Power Ministry and each integrated project is carried out by a single construction authority. Less important projects such as in Central Asia and the Caucasus are often carried out co-operatively by the Central Power Ministry and the Water Management Ministry of the republic concerned.

The form of organization for river basin administration largely depends on the scope of the powers to be conferred on the river basin authority. The T.V.A., for instance, has responsibility in the fields of navigation, flood control, power, agricultural and other resources within the Tennessee valley. The Hokkaido Development Corporation of Japan is based on a strong inter-departmental set-up with planning and executive duties. The example of a mixed Corporation combining features of both these types is furnished by La Compagnie nationale du Rhône.

It appears that there is no single correct way to organize and administer a multi-purpose river basin development programme. "The plan of organization must in each case be fitted into the general governmental structure and into cultural patterns and political traditions of the countries and regions which are involved." No perfect solution has been found for the problems of organization and administration even in highly developed countries.

Whatever the form of organization, however, the task of a river basin authority is to co-ordinate resource development in a unified manner, and to secure increasing local support, understanding, and participation. In this direction, much may be learnt from experiences of the United States where each State has established, guided and assisted a net-work of local districts. Single-purpose districts which are a specialized form of government with powers and authorities for resource development are 2200 drainage districts, 750 irrigation districts, 200 flood control districts and (since 1939) about 2700 soil conservation districts. A limited number of multi-purpose districts have broad powers to deal with several phases of land and water development. Under the U.S. Federal Watershed Protection and Flood Prevention Act, 1954, planning assistance and technical and financial aid are amply provided. By February 1, 1959, as many as 1054 applications from local organizations for assistance in watershed programmes had been received. Planning investigations had been authorized for 410 watersheds and 142 had been approved for construction operations.¹

KARUNA MOY MUKERJI

¹ Harry A. Steele, *op. cit.*

CHAPTER 1

INTRODUCTION

In all contemporary progressive countries of the world, considerable attention is paid to resource planning and conservation. In the planned development and utilisation of the existing physical and material resources of a country, what one finds today is a sort of regional emphasis which may broadly be described as "regionalism" in planning. The natural materials and energies, such as arable lands, forests, minerals, climates, solar energy, etc., are unevenly distributed over the globe. All over the world we find certain areas which have abundant rainfall with plenty of rivers in them, certain others which are fully arid, etc. Each of these constitutes a separate region.

Just as the world can be divided into a number of natural regions, each and every country can be divided into a number of regions on the basis of the availability of resources, spread of population, economic and social habits of people, etc. For example, in any country there are regions which are exclusively noted for mineral deposits, certain other areas through which rivers wend their way, covered with rich evergreen vegetation, areas where rare earths are abundantly obtained¹, and so on. In the planned development of a nation, the practice of putting into execution a steam-roller method of planning for the entire country without taking into consideration the diverse conditions that obtain in various parts would lead to a lop-sided economic development and result in economic waste of productive resources.

Thus, the maximum development of each region should be arrived at, and when these regions attain their full economic development, the entire country of which these regions are component parts would attain the maximum development. Regional planning, be it noted, is a type of comprehensive economic planning which emphasises the unity of nature and the inter-relation between the different natural resources of a region.² It realises that in the exploitation of resources the regional balance must be preserved. Only a well-planned unified utilisation of resources can both restore and stabilise the rhythm of nature. For this, all economic problems of the region should be dealt with as one composite whole. And this requires common purpose and unity of control over the development of the resources of a region.

The unique feature of regional planning is that it provides the people of a nation with maximum economic opportunity. It must thus be remembered that regional approach in planning is not a short-

¹ Indian National Planning Committee's Report, *River Training and Irrigation* (Bombay, Vora & Co., 1947).

² *Indian Journal of Agricultural Economics*, Vol. I, No. 2, Oct., 1946, p. 71, From "T.V.A. Approach and its Possibilities in Indian Agriculture" by Akhtar Hussain.

term palliative, but a dynamic approach in long-term economic development and maximum economic opportunity.

This aspect was, however, unfortunately overlooked in the planned economic development of countries, notably of the West, in the early parts of the present century, and the practice of isolated economic development even threatened the economic soundness of certain nations. President Roosevelt of the U.S.A. advocating the creation of *Tennessee Valley Authority*—a classical example of an adventure in regional planning—said in a message to the American Congress: "Many hard lessons have taught us the human waste, that results from the lack of proper planning. Here and there a few wise cities and countries have looked ahead and planned. But our Nation has just grown. It is time to extend planning to a wider field comprehending in one great project many states directly concerned with the basin of one of our greatest rivers. This in a true sense is a return to the spirit and vision of the pioneer. If we are successful we can march step by step in a like development of other great natural territorial units within our borders."¹

The concept of region as a tool for planning had its origin practically during the Great Depression. It was, however, mainly concerned with regional planning *vis-a-vis* urban development. Later on, with the development of the concept of "regional balance", planned development of a region assumed dynamic character, involving an endeavour aimed at developing the economic, social and cultural aspects of a region, while at the same time maintaining a balance between the national and the regional development.

The best known and one of the most advanced regional planning agencies in the U.S.A. is the T.V.A. Elsewhere in the U.S.A., a more complex scheme of regional planning has been worked out which involves a multiplicity of Federal agencies such as the Bureau of Reclamation, the Corps of Engineers, the Soil Conservation Service, etc. But the T.V.A., taken singly, has been the most fruitful source of inspiration in resources planning elsewhere in the world, for, as is well known, the Tennessee Valley was a very poor and underdeveloped area before it was brought under the scheme of regional planning; and today it is one of the most well-developed regions in the world. "It has effected a wonderful revolution in the life of millions of people."²

This brings us to a discussion of the significance of regional planning *vis-a-vis* a specific type of natural region, namely, river basins. It may be noted that of all the natural regions, the most comprehensive ones for the planner are the regions where rivers spring up and through which rivers flow—otherwise known as river valleys or river basins. The life and activities of the inhabitants even of a far-flung river basin seem to have many things in common. The spread of natural resources in such a region in most cases is uniform and more readily exploitable. It is widely recognised that river basins or river valleys are distinct

¹ President Roosevelt's Message to Congress, 1933, quoted in Prof. Julian Huxley's *T.V.A. — An Adventure in Planning*, p. 1.

² *Multipurpose Projects* (Delhi, Govt. of India, 1952), p. 18. (Ref. to T.V.A.).

regions and that they need comprehensive planning. David Lillienthal, the then-Chairman of the T.V.A., stated: "Rivers all over the world are waiting to be controlled by men—the Yangtze, the Ganges, Ob, Parana, the Amazon, the Nile."¹ It is in America that the idea of multi-purpose development of river basins took firm roots. "Land, water and people go together. The people cannot reach the highest standard of well-being unless there is the wisest use of land and water."²

In most of the countries of Asia where rationalisation in the use of land and water has been neglected rather much too long, while the population has been rapidly growing, it is perhaps not so much the question of reaching the "highest standard of well-being" (though that should, no doubt, be the ultimate objective), in the near future, as the problem of feeding the hungry millions and to meet their bare needs. In India, for example, inspite of her vast potential wealth, such as water, land and other natural resources which can favourably compare with any advanced country of the west, the large number of people are not having enough to eat nor sufficient clothing to wear. In the Bengal Famine of 1943, for example, about 3.5 millions died of starvation and though this was partly attributed to abnormal conditions prevailing then due to the war, the fact remains that most of these peoples were living barely above the starvation level.³ Even under normal conditions, India though predominantly an agricultural country is not self-sufficient in the matter of food. In other parts of Asia, perhaps with the exception of Japan and parts of Russia, the conditions are just the same. Their economy is based on primitive methods of cultivation, and until recently, without any serious effort being made for the conservation and utilisation of their potential land and water resources with a view to raising the standard of living of the masses the bulk of whom are very poor. China, too, despite her vast natural resources is comparable with India in respect of her state of backwardness. China's potential water-wealth appears to be tremendous, though, latterly, the Yangtze and Yellow Rivers appear to have been well-conserved. There are, however, other aspects of rivers that demand serious attention and improvement there.

"It is", in the words of a well-known expert, "a great adventure in regional planning indeed when man begins to conserve the region through which a river flows."⁴ And this type of regional planning is achieved through the implementation of multi-purpose projects. The concept of multi-purpose projects is a relatively new development. A river means a great many things. It means water for irrigation; power

¹ Message by David Lillienthal quoted in the paper read by Kanwar Sain entitled "Utilisation of Water Resources in India." Vide *Floods and Flood Control*, Series No. 3, U.N. Publication, 1952.

² *Loc. cit.*

³ For a detailed account of the horrors of the Bengal Famine of 1943, Vide Dr. Karuna Mukerji's: *A Socio-Economic Survey of 49 villages* (Calcutta, H. Chatterjee & Co. Ltd. 1952).

⁴ *Indian Journal of River Valley Development* (Calcutta), March, 1950. From a Message from Gordon Clapp, Chairman, T.V.A.

for industries and lighting; a means of transport; a venue for recreation, and what not. Multi-purpose development of a river basin is, of course, done mainly through the construction of giant dams to conserve water. There was a time when a dam was constructed for the purpose of irrigation only. Again, when a structure for improvement of navigation was thought of, it was designed only with that end in view. When a power dam was to be constructed none but the designer and the operator was concerned. Fortunately, that day has passed. Today dams are built to perform several functions simultaneously. Careful attention is given to attain the highest efficiency through combining the design provisions for many uses of the present-day public work, and development is obtained through the irrigation of desert lands and the creation of new opportunities to make homes and build up new communities. It is fostered through low-cost power for farms, for homes, cities and for mining and processing materials for manufacturing the essential tools of modern industrialised civilisation. All these are promoted through other services "wrung from unwilling rivers".¹

An economist's main interest in river resources planning lies in economic gains that are derived from implementing a river project. They must, however, be commensurate with the money and efforts put into the development of a river basin at least in the long run. This necessitates detailed socio-economic surveys and studies. Once a project is found to be economically justified, investment of capital is necessary for implementing it. It is the economist's look-out to have to examine how best to find and secure the formation and outlay of capital needed. Then there remains the question of administration of the construction of dams, canals, power houses, etc. which again is a big aspect having intimate relation with managerial economics. Once the project is finished, the role of the agricultural economist looms large. In fact, this is the most important of all aspects of post-construction planning, namely, the economics of land development in the new river project areas. As one writer has remarked, "A multi-purpose dam costs crores of rupees. This is an investment in water. But this heavy investment will be buried in sands in proportion as the erosion of lands in the catchment area is allowed to go unchecked, bringing down heavy loads of silt into the reservoirs. Where erosion is serious the silting up of dams is fast".² Soil conservation and river projects are, therefore, intimately inter-connected operations. Again, every effort will have to be made to utilise the irrigation facilities provided by a river valley project to the fullest possible extent.

The land-use pattern cannot be the same for a whole river valley. While in upper parts of the river basin the emphasis will have to be placed on soil and water conservation with forestry occupying pivotal

¹ Vide, the article by K. C. Niyogi, "River Training in India" in *Science and Culture* (Calcutta) Jany. 1946, p. 253.

² Dr. Sudhir Sen's article entitled "Economic Aspects of Land Development in River Projects". Vide, the *Indian Journal of Agricultural Economics*, Vol. 10, No. 1, March, 1955, p. 187.

position, in the lower catchment area more attention is to be placed on cultivation of cereals and other plants and a wider range of crops with improved yield per acre. This opens up new possibilities for increasing the production of wealth in the region through which rivers flow and the integrated development of agriculture, dairy farming and processing industries. In the low-lying areas, special attention has to be placed on adequate drainage. For increased production in the newly-developed areas of the river valley, demonstration farms and propaganda teams will have to be set up. Quite a good number of experienced cultivators will have to be settled in these areas. The question of land-holdings and tenure rights, too, is important in these areas. The colonisation in the newly-developed river project areas is another difficult task. Then again, what should be the rate of betterment levy that the new settlers and old inhabitants will have to pay, and when and how its payment will have to be made? Thus, we may sum up the main tasks to be undertaken in a new river-valley development area under the following heads, arranged according to the constructional and economic activity course:¹

- (1) Clearance of jungles or standing trees or shrubs.
- (2) Terracing, levelling and bunding. This comes under conservation.
- (3) Excavation of field channels.
- (4) Provision of subsoil and surface drainage wherever necessary.
- (5) Provision of adequate credit facilities to the farmer.
- (6) Provision of adequate agricultural labour.
- (7) Reorganisation of the size of holding and reorientation of tenure rights.
- (8) Organisation of mixed farming and of auxiliary village industries to keep the peasants engaged in the off-season.
- (9) Anti-malarial operations and intensification of health activities.
- (10) Establishment of demonstration farms.
- (11) Supply of manure.
- (12) Supply of power at cheap rate.
- (13) Fixation of the rate of Betterment Levy, and
- (14) Transfer of population and payment of compensation.

Thus, we see that from the very beginning onwards, the question of developing a river basin presents innumerable types of questions in economic planning and no wonder Prof. Julian Huxley has titled his book on multi-purpose development of Tennessee River Basin (T.V.A.) as "An Adventure in Regional Planning".

Next to the U.S.A., India is believed to have the most abundant supply of water resources in the world. But, she utilises only about

¹ Vide the *Indian Journal of Agricultural Economics*, March, 1955 p. 203. A detailed discussion on Betterment Levy is taken up in a subsequent chapter of this volume.

6 per cent of the flow of her rivers. India produces not more than $1\frac{1}{2}$ per cent of the water power available in her mighty rivers and waterfalls and snow-clad Himalayas.¹

During the past several years, however, considerable advance has been made in India, as elsewhere in the world, in the utilisation of water for the development of irrigation and hydro-electric power. Formerly, most of the Indian projects for water exploitation were undertaken with very limited objectives and little attention was paid to their integrated development for multiple benefits. In recent years, the method of and the views on exploiting water and land resources have undergone a reorientation with the result that the river and its basin are considered as a unit irrespective of the arbitrary territorial boundaries which may divide the unit.

The economic objectives of river-valley development projects are, however, generally stated in broad and cursory terms and hence they afford little basis for fully accurate economic analysis, not to speak of evaluation. They can mean much or little depending on the way they are interpreted, but they largely fall outside the scope of conventional economic analysis as such. The concern of the Tennessee Valley Authority, for example, is "the responsibility for pervasive concern about the natural resources of the Valley region" and an "integrated approach to the whole complex problem of resource use".² Elsewhere, it is pointed out that its task is "to help the people of the Tennessee Valley expand their control over their natural assets of waters, soil, and minerals."³ In addition to major purposes, there are undoubtedly quite a number of subsidiary or secondary purposes which are important in undertaking the development of river valleys. One of these is the purpose of using the projects as the vehicles for pump-priming or compensatory spending of the modern days. This motive may be quite important and significant at particular times only. The investments in valley projects are not quite easily adjusted to the need for deficit spending, and conservation policy should not be dependent on such a temporary and oftentimes fluctuating principle. In fact, this consideration alone would not justify the starting or expanding of river-valley projects.

Still another point behind the plea for river-valley development is that of using the investments to direct the central aid to low-income areas or regions. Put in other words, it is a purposive device to aid backward or underdeveloped areas of a country. This argument, too, can be used only in certain cases. It is evident that this tells us nothing about the characteristics or the desirability of valley development as such.

Though in some cases, one very well-defined socio-economic purpose may be set out leading to the undertaking of the programmes

¹ *Multi-purpose Projects in India—Damodar Valley*. A Pamphlet issued by the Government of India, 1952, p. 10.

² *Tennessee Valley Authority Annual Report* (Published by T.V.A.) 1948, p. 39.

³ *Ibid.*, 1949, p. 1.

of river-valley development, generally not one but a great variety of motives play a part, depending on time, place and social environment. For example, socio-economic problems associated with the Tennessee Valley Development are considerably different from those of Colorado River Valley Development. Similarly, when the economic performances and social habits of different groups of people of India are considered, the programming of river-valley development in this country will pose totally different problems than those of the U.S.A., and consequently the development programme will be essentially multi-directional.

Assuming the case for a multi-directional development of river valleys in India, another problem that immediately comes up is to find out the suitable agency to shoulder this big task. On this very problem, literature is abundant, and it is needless here to enter into that controversy. It is a well-known fact that the problem of development in underdeveloped countries requires not so much of the fulfilment of "marginal conditions" as of "total conditions". Where once-over structural changes as well as a great deal of "lump investment" spread over a broad front are the prime need for net capital formation, it is futile to think that private initiative will be forthcoming to any appreciable extent. Obviously, reliance must be on public undertaking.

The once-over change does not, however, determine the growth process; it only assists the change. Though the form of stimulus is undoubtedly important, the expansion or the moving trend will depend on the positive, sustained, and self-reinforcing response of the people to the initial change bringing about a chain of secondary expansion by exploiting the external economics. These will, however, ultimately depend on the character of economic institutions, the distribution of income and pattern of investment outlays, which we shall discuss in some detail in later chapters.

CHAPTER II

THE FINANCING OF RIVER PROJECTS

Adequate financing, and, therefore, the availability of colossal sums, are a *sine qua non* for the successful implementation of Multi-purpose River Valley Projects. The immediate question, however, is: from which sources and by which means will funds be forthcoming? We shall discuss in this chapter various aspects of financing river-valley projects in detail, with special emphasis on the financing methods and problems related to India's river planning.

During the post-Independence phase of river planning in India, the nature of the river projects is such that most of them are interstate in scope and effect. We may cite the case of Damodar Valley Project, the Tungabhadra Project, etc. Similar is the case with many of the river projects of the U.S.A. The nation as a whole is benefited by such development projects as a result of the enhancement of the general welfare of the nation as a whole. Therefore, it is desirable for the Central Government of the country concerned to take a vital part

in the financing of its river projects. On the other hand, the respective states involved must also share the responsibility of financing as they are definitely benefited by such river development. Moreover, a regional authority (such as T.V.A. or D.V.C.), in charge of a river project, is supposed to play a vital part in the financing of the programme of development.

We may explain here how reclamation projects are financed; be it mentioned that reclamation is a utility operation. For private enterprise, the financing of the programme follows the conventional pattern of utilities. Money is secured at interest in the commercial markets of the nation (and here we have in mind the case of free enterprise countries where reclamation sometimes is undertaken by private enterprise) to finance construction. In the United States of America, only in the phase of power production in river projects does private enterprise take a hand. The irrigation phase of the programme in that country, except for pumping groundwater, has become dependent on Federal Leadership with its finances being supplied without interest by the Reclamation Fund and by the general funds of the United States Treasury.¹ In India, in the river projects private enterprise has little or no role to play at present and hence the complications regarding financing programme are not so much in evidence as is the case in the U.S.A.

Let us discuss the problem of financing river projects from a still wider angle: river planning calls for a well-thought-out long-range economic strategy. In the underdeveloped countries and, to some extent, in the developed countries, big trusts and banks are reluctant to tie up their capital in schemes that will pay off many years later, especially when the effect is expressed not so much in dividends as in general upgrading of economic standards. The T.V.A., considered in many quarters as the "Ideal of Economic Democracy" and even as a "Socialist Island in a Capitalist World", has received large government funds for the construction of a series of hydro-technical projects.

Judging from the trend of times, it is to be presumed that the financing of the big projects, especially aimed at the integrated development of river resources by private enterprises is well-nigh impossible. It has been the accepted trend, and is the accepted trend in underdeveloped countries, that financing of development projects is practically possible only by the State sector. In these countries there is little hope for their own private enterprises or those from outside to invest money therein. This view is confirmed by the record of past few years in India. The financing, again, of the D.V.C. by external agencies constitutes only a small fraction of the total cost of the Damodar Valley Project.²

Let us turn now to another aspect of this problem. The pioneering country in the field of river planning (U.S.A.) started off large-

¹ Alfred Golz, *Reclamation in the U.S.A.* (Mcgraw-Hill, New York, 1952), p. 276.

² Vide the third paragraph but the last of this Chapter.

scale river planning under Regional Authorities. What, however, are the possible financial potentialities of Regional Authorities which very often are in charge of the projects? We should seek to answer whether the regional River Valley Authority can finance itself. The Regional Authority is a non-profit-making body. It is not a body to raise revenue. Its goal is to develop and enhance the welfare of the region.

Two principal methods of financing the multi-purpose river-valley projects are open to us. In one case, the River Valley Authority may be empowered to borrow the necessary capital and amount required for current expenses during the development, the debt and interest to be repaid from its earning in due course; and in this case it can either sell bonds in the open market or borrow the whole or part of of the funds from the government treasury. In another case, the Authority may be financed by appropriations to the government. The procedure is the same as the ordinary activities of the government are financed (i.e. coming to Parliament, annually offering estimates of need and then after cross-examination being awarded what the Parliament believes to be adequate).¹

Now the question is: which one is to be followed so far as the River Valley Authority is concerned? The latter method with some modifications appears to be the ideal one to be followed.

The Authority should have some bond-issuing powers: that is, the power to raise loans for specific purposes. Of course, this power has both advantages and disadvantages. On the one hand, Parliament may relieve itself of the task of finding appropriations annually year after year for a long period. It is clear that if the Authority is given a loan-raising power, it will escape government control over activities exercised through the Authority's need to approach Parliament annually for money. Parliament should be extremely sensitive on the question of allowing the Authority excessive latitude of operation and expansion. On the other hand, the Authority should have some freedom and latitude. This is done by favouring the Authority with the possession of bond-issuing power. Again, there seems to be the Authority's need of sufficient funds to effect purchases of properties *en bloc*. But, against these considerations is the fact that a river valley authority's unified programme costs a very large sum of money which the Parliament concerned cannot be expected to advance all at once. Until the Authority shows signs of being able to repay the investment market, Parliament will hardly be ready to vote the substantial funds required and the Authority must necessarily wait for several years before the fruits of its work can even begin to materialise! Finally, there are such activities as planning its agricultural programme, its public health work, flood control, transportation, forestry and the rest which are not of a business character like the power undertaking but are more in the nature of ordinary social benevolent activities normally financed by governments, not out of loans but from tax revenues. Therefore,

¹ Refer "Financing of River Projects with special reference to T.V.A.", a paper (mss.) by Dr. Karuna Moy Mukerji.

the principal means of financing comes to be by Parliament appropriations and only very small latitude is to be given to bond-issuing or loan-raising powers of a multi-purpose river-valley authority. This method of lump-sum appropriations differ very widely from the method of appropriation by miniature itemisation of purposes and sums for expenditure. This method permits financial flexibility each year. This does not mean that the Authority has been given or is able or desires to do what it likes without submission to Parliament. In fact, the Authority is subject to the Budget accounting and is obliged annually to submit its reports to the Budget department.

In the above method, one more sign of flexibility is found. The Authority, as is the case in the United States, will only be permitted to retain its earned revenue from power and other services it may render and will not be required to turn the money over monthly to the State Treasury. There the legislation is so enacted in the case of most Authorities as to make them pay to the Treasury not all of their proceeds but only their net proceeds and even so to pay them in only at the end of each calendar year. This latitude thus permitted to the Authority can be appreciated when it is considered that the definition of net proceeds in the Act means proceeds after deducting from gross revenues "the cost of operation, maintenance, depreciation, amortization and amount deemed by the Board as necessary to withhold as operating capital or devoted by the Board to new construction."¹

The principle of flexibility is very important to any government corporation likely to be involved in business analogous to that of a multi-purpose river-valley authority. If the Authority's rights to spend are dependent on terms defined in the Appropriation Act, it cannot without illegality go outside them. It cannot get releases of money from the State Treasury to meet an emergency and will need, therefore, to be able to anticipate emergencies whereas a real emergency by definition is impossible of anticipation.

We shall now discuss the financial problems in the case where benefits of a multi-purpose river-valley development embrace more than one province or State. In this case, an equitable distribution of costs among the States and the Centre is inevitable, and arguments will be made among all the provinces or States and the Centre to share the responsibility of finance. The negotiation of contracts with the States to provide for collections which cannot be made in full from direct beneficiaries should receive due consideration as a prerequisite to Centre's investment in a water-resource development. Such contracts should cover the total of the project costs which should be carried equitably by all benefited groups in the entire country. The distribution of costs and collection should be the responsibility of the Centre. Such a policy will immediately stimulate the greater interest and responsibility of the Centre in water-resource development. That interest will be continuous and active from the initiation of studies through the whole life of the project. Such a policy will also provide means of

¹ 'Board' means Control Board, i.e., executing authority.

securing appropriate returns from indirect local and state beneficiaries which it is difficult (if not undesirable) for the State Government to secure by direct agreements with the groups involved. From our study of this aspect, we see that the burden of finance of a multi-purpose river project in the case where more than one state or province is involved, should be properly apportioned. But the question is: which principle will be followed in this case? Leaving aside the share of finance by the central government which must pay the cost of increasing the general welfare of the nation, the principle of apportionment among the States will be either of the following: (1) incremental increase basis, (2) value of land benefited, (3) value of flood damages avoided. ("Incremental increase basis" means the sum total of all benefits realised year by year.)

It has already been mentioned that river plans may be executed either through a Corporation (or an Authority as it is widely known) or through Control Boards. To the Control Boards finance is directly supplied by the State government or governments and hence they need not bother about issuing bonds or raising finance by themselves. In the case of projects under Control Boards, which fall under more than one State, the shares of the respective States are determined on either of the three principles mentioned in the last paragraph. The question of financing private enterprise projects does not arise here as finance in such instances is not the problem as only those who are having enough to invest would dare launch such projects.

Let us now turn to the Indian conditions as far as financing of river projects is concerned. The practice in India is for the Centre to frame a resource-budget indicating the plant, equipment and manpower that are likely to be available for a period of 15 years to begin with, with the help of local governments and the River Project Corporation.¹ Before drawing up the Budget, the Centre decides the priorities to be given to the different sectors of our economy. The river-project resources-budget shall be liable to variation from time to time. Within every resources-budget a detailed allocation of resources to specific river projects are made depending on the urgency of the project and the expected yield of investment over a number of years. *Prima facie*, other things being equal, schemes which yield a high rate of return in the amount of consumable power, or in the acreage of land irrigated productively will receive priority over others.

In the pre-Independence era, project undertaking followed a particular pattern and so its financing. The projects were generally for a single purpose, and government would undertake such a project only when sufficient funds could be raised in the market. This way of financing made both the undertaking of the programme and its successful completion dependent on market conditions, resulting in alternative situations of rash undertaking without proper investigation during the boom period and shelving of works half-way during the slump period.

¹ At present there is only one River Project corporation in India, namely, the Damodar Valley Corporation.

In view of the above considerations, the Planning Commission suggested the formation of an Irrigation Development (Ways and Means) Fund by each constituent State of India, into which "a definite sum of money could be paid every year either from the general revenue or from the loans or savings and to which should be added loans and grants if any from the Central Government."¹ This fund was to be non-lapsable and all expenditure for irrigation and power was to be met from it. It would help the efficient execution of the projects once they were decided upon, and there would not arise any serious chance for dislocation caused by the fear of grants lapsing and uncertainty as to the availability of funds year by year. It is but natural and at the same time necessary that the contribution to this Irrigation Development (Ways and Means) Fund by each state would vary. This fund would enable the successful implementation of the 15-Year programme that was laid down by the Centre and States for irrigation and power development. It goes without saying that this proposal of the Planning Commission aims at the improvement of the ways and means position. All the States in India have accepted this proposal without exception, and the river planning finance is mainly centred round this fund.

In the post-Independence era of river planning in India, the financing of the Damodar Valley Corporation is perhaps the one which attracts our attention most, for, it is the single instance of a River Valley Corporation financing river planning in India. Apart from that, a degree of autonomy vests in the D.V.C. which Control Boards (administering other projects in India) are not vested with. In Corporation financing in India, there exists possibilities for a tug-of-war between Corporation autonomy and checks and balances exercised by the Centre as well as the State governments. Hence we shall try to examine some aspects of D.V.C. financing.

The method of financing D.V.C. is unique in some respects at least. The D.V.C. Act lays down that the three participating governments, namely, Bihar, West Bengal and the Centre shall provide the entire capital required by the Corporation for the completion of any project undertaken by it. Each year the government is required to pay its share of capital on the dates specified by the Corporation. In case of default, the Corporation has the right to raise a loan to make up the deficit at the cost of the government concerned. In such cases, it has also been empowered to borrow money in the open market or otherwise with the approval of the Central Government. The D.V.C. was launched without any initial capital or grant. The D.V.C. Act sought to give the necessary guarantee that funds would be forthcoming as and when required. It also obviated the need to find large sums of money to begin with, on which the D.V.C. would have to pay interest. On the face of it, the financial powers conferred on the D.V.C. appeared adequate. But it has been complained that, as a matter of fact, it

¹ *First Five Year Plan*, p. 361.

was "devoid of the financial means".¹ On grounds of financial stringency drastic cuts have been applied on each of its annual budgets. The cuts have been restored later in the financial year generally but only partially. Whereas the very intention of the D.V.C. Act was to adjust the flow of funds to the actual programme of development, in practice it was the programme that had to be adjusted to the flow of funds. It has already been stated that D.V.C. has been set up by three participating governments, namely, Bihar, West Bengal and the Centre. The capital is shared among the three in accordance with a formula which aims at equating the financial liability of each partner to the benefits expected to accrue to it. In practice, the Centre finds all the money not only to cover its own share of capital expenditure but also the shares of West Bengal and Bihar. The amounts thus advanced are, of course, debited against the two State governments as loans from the Centre. Clearly, this is a form of indirect finance. In this context, the State governments provide a somewhat curious argument: as the Centre is advancing all the funds it also bears all the financial risks involved in the enterprise. Should the D.V.C. fail, it is quite probable that the State governments concerned would not be able to repay the loans from the Centre. In this case, the Centre will gain nothing from this paper liability. But, should the D.V.C. succeed, prove financially sound, and self-liquidating, the Centre would get back all its money, including interest from the earnings of the Corporation. In that case the Centre does not stand to lose by financing the whole project. Perhaps there is an element of realism in the above line of argument. But this realism has to meet a very important point: A scheme started for the benefit of a State or more than one, might or might not succeed; there is, however, no point in saying that the Centre alone should take the financial risk. The risk-taking should not be the burden of the Centre alone, but should be that of participating State governments, too. Both in risk-taking and reaping project benefits Centre and States should actively play the role of sincere partners. The above-mentioned mechanism of indirect finance has produced some very awkward results. The two State governments have been claiming a say in the affairs of the D.V.C. on the ground that they have large financial stakes in the undertaking and have in addition their own legislatures and public to satisfy. It should be conceded that given their financial liability *vis-a-vis* the Centre, there is countable force in their contention. In 1957, the terms and conditions of the repayment of the Central loans became a major issue between the Centre and the West Bengal government. Pending its settlement, fresh advances of funds were temporarily suspended. The point that the states' financial liability entitles them to a corresponding control of the affairs of the D.V.C. has not been settled finally even today (excepting some arbitrary agreements for representation of members of the respective states in the D.V.C. Board). These matters have introduced an element of uncertainty which is not a normal feature of

¹ Refer *The Indian Journal of Agricultural Economics*, March, 1955, p. 194. Dr. Sudhir Sen's article "Economic Aspects of Land Development in River Valley Projects" (pp. 187-194).

public corporation financing elsewhere. In addition to the above, there exists another vital problem. This is the status of the Financial Advisor to the D.V.C. There have been moves from time to time to confer an independent status on him. He, along with the Secretary of the Corporation, is appointed by the Central Government and not by the D.V.C. Board of Directors which is composed of representatives of the States and the Centre. This is quite an unusual feature. Should there exist any difference of opinion between the Financial Advisor and the Corporation Board of Directors, the matter will have to be reported to the Centre's competent authorities. This is in a way the negation of financial autonomy of the corporation. In an autonomous public corporation, the practice is that it is the Board of Directors that must control the funds. In the working of a public corporation, the Corporation Board thus takes the full responsibility for all decisions and ultimate results. It follows that financial policy can never be independent of the Board's policy. This is an accepted convention which public corporations the world over follow.

The history of public corporations in the U.S.A. provides a striking example in support of this point. "As at the end of June 1952 the capital investment in Corporations in the U.S. in which the Treasury had an interest was of the order of \$6.4 billions and their balance-sheet totals exceeded the figure of \$38 billions. The income and expenditure of these Corporations balanced at about \$2.3 billions, leaving a small sum of about 125,000 dollars as surplus. What was more, the cumulative unreserved deficit or surplus position as at the end of June, 1952 was extremely satisfactory in that it showed a total loss, after transfers to special reserves, of about \$366,000 only—a negligible amount considering the turn-over of Corporations".¹ Reflecting on the above position, *The Eastern Economist* comments: "It is hardly an accident in view of these figures that Corporations of the U.S. have enjoyed so much autonomy. This autonomy has largely been due to financial independence."²

Here we have to debate an important point: supposing that the D.V.C. is financially self-sufficient, it follows that control from outside would come to an end. The D.V.C. even today does not, however, have financial self-sufficiency. If, therefore, it continues more or less to be dependent on government grants, it is understandable that the Centre and State governments concerned will naturally curb its autonomy at least to some extent, either through the Financial Advisor or through a mechanism of checks and balances. But, the thing for the D.V.C. seems to be primarily to become financially independent. This, however, seems to be a remote possibility. The present situation leading to the curbing of the autonomy of Damodar Valley Corporation by the Centre as well as the State governments, therefore, is only a result of circumstance, and there seems to be no way out. There is

¹ *The Eastern Economist*, New Delhi (Weekly) dated July 31, 1953, pp. 181-182.

² *Loc. cit.*

some truth in the statement that the D.V.C. has been brought down to the level of Control Boards in matters of finance.

The D.V.C. Act contains no provision as to how exchange control regulations should apply to the D.V.C. From the very outset, the D.V.C. was required to approach the Exchange Control Department to obtain clearance for any single item of foreign exchange expenditure whether large or small. The Corporation should know exactly where it stood in the foreign exchange position, with sufficient time ahead. So also the foreign exchange allotments to the D.V.C. should be made available at least in half-yearly allotments rather than piecemeal. This point has to be stressed inasmuch as a project like the Damodar Valley cannot be carried through without substantial imports of plant and equipment and technical services.

The foregoing aspect of financing the D.V.C. reminds us of one important point. The Corporation was launched as an experiment. It was a radical departure from the established traditions of the administrative system in India. The D.V.C. from experience has, however, found that it could not have the full autonomy of a Corporation. Thus, the emphasis in India has tended towards semi-autonomous Corporations and Control Boards which have a direct link and are subject to the control of the Centre. This was perhaps necessary due to the peculiar conditions in India, namely, our inability to take risks with huge amounts of money and our inexperience in the proper administration of the Corporation.

From reports obtained from the Bhakra and Hirakud and such other Control Boards, it, however, seems that there is less or no hitch in matters of finance as far as these projects are concerned.

It will now be relevant to recount in the following few paragraphs the quantum of finances estimated to be necessary for covering the costs of river projects, including power and irrigation projects, etc., as provided for in the Indian Five-Year Plans. We shall also dilate a little upon the prospects and difficulties of securing foreign financial and technical assistance for the success of our projects, in the light of foreign exchange difficulties now confronting India.

As is well-known, the First Five-Year Plan provided for a total outlay of Rs. 2,069 crores in the public sector. Of this Rs. 1,258 crores were met with from budgetary resources of the Central as well as State governments and the balance from other resources like external assistance, deficit financing and sterling balances lying to the credit of India. The river valley projects (including the single purpose projects) formed the biggest single unit of expenditure in the Plan. The magnitude of the expenditure involved in irrigation and power projects envisaged in the First Five-Year Plan can be seen from the fact that whereas the total capital cost incurred on Provincial (State) governments' irrigation works prior to 1947 came to about Rs. 100 crores only, an expenditure of as much as Rs. 558.41 crores was envisaged on Irrigation and Power Projects including the multi-purpose projects in the First Plan alone. Immediately after the World War II, there

was considerable activity in the development of irrigation and power projects. The total cost of irrigation and power schemes which were under construction in 1951 was, on completion, estimated to be Rs. 767 crores. It was also felt by the authors of *The First Five-Year Plan* that an expenditure of about Rs. 518 crores had to be incurred on projects already in progress during the five-year period of the Plan. The Second Five-Year Plan estimates that the total cost of irrigation and power projects initially included in the First Five-Year Plan (including those in the immediately preceding years) was about Rs. 970 crores of which irrigation accounted for about Rs. 620 crores. During the First Plan period itself, the scope of some projects was improved and some others revised, and enlarged. The expenditure actually incurred, however, for projects in hand at the time of formulation of the Second Five Year-Plan was estimated to be Rs. 340 crores, the balance being carried over to the Second Plan period. The total cost of the new irrigation projects included in the Second Plan is about Rs. 380 crores of which Rs. 172 crores are expected to be spent during the Second Plan and the rest to be carried over to the Third Plan period. A number of power projects, commenced in the First Plan, are at present in different stages of construction. A total outlay of Rs. 160 crores is required for these schemes during the Second Plan period. Apart from these, an additional outlay of Rs. 245 crores is proposed for new schemes to be completed during the Second Plan and Rs. 22 crores for schemes, the benefits from which will be derived in the Third Plan. Thus, we see that the outlay for power generation is Rs. 427 crores in the Second Plan.¹ As far as flood control is concerned, "a tentative programme of works to be carried out during the first five-year plan was prepared and a provision of Rs. 16.5 crores was made for assistance by way of loans to States for flood control schemes". The *Second Five-Year Plan* estimates that a total amount of Rs. 8 crores might have been spent during the First Plan period. In the Second Plan there is a provision of Rs. 60 crores for immediate and short-term measures including Rs. 5 crores for surveys and collection of data. There is a provision of Rs. 3 crores for inland waterways development in the Second Plan which also includes part of development and inland navigation that fall under the multi-purpose river basin schemes. The exact allocation of capital outlay is not readily available. A provision of Rs. 20 crores has been made for soil conservation activities, including those in the river valleys during the Second Five-Year Plan period. It is estimated that the programme of irrigation and power envisaged in the Second Plan would need about Rs. 170 crores of foreign exchange for power projects and Rs. 25 crores for irrigation projects alone.

It is to be specially pointed out that India was receiving external assistance for her river development through the International Bank for Reconstruction and Development (IBRD) and through the auspices of the Colombo Plan. For the Damodar Valley Development two

¹ For figures quoted in this paragraph, vide *Second Five Year Plan*, Govt. of India publication (1956), pp. 326 and 337.

loans of the value of \$18.5 million and \$19.5 million were made available by IBRD in January, 1953.¹ The Bank's loan of \$18.5 million was used for the construction of Bokaro Power Plant and a dam at Konar. The Bank's loan of \$19.5 million is being used for a second group of projects under the D.V.C. These are two multi-purpose dams, each with a hydro-electric plant and an extensive irrigation system, including a diversion Dam on the Damodar River. A major portion of the finances required for the Mayurakshi River Project was made available by Canada under the Colombo Plan Scheme.

India's foreign exchange position has been extremely delicate in the post-war years and in view of the compelling need to reduce the demand on foreign exchange, the Second Plan specifically has stated that every effort should be made by the project authorities in India to eliminate avoidable indents on imported machinery.² Because of the acute problem of dollar shortage, the D.V.C. had to negotiate a contract with an Italian firm in 1948, though the United States Steel Corporation could offer better terms.³ In spite of attractive proposals received from hard currency areas, the D.V.C. signed a contract with a French firm for preparing designs and target estimates for Konar Group of Dams. These are only a couple of the many such situations created by dollar shortage. Our river projects, therefore, had to suffer heavy losses. More than these, the Indian projects will have mainly to depend on soft currency areas for their essential supplies. The rupee prices of such supplies are likely to go up because of (1) the rising trend in costs already noticeable in most soft currency countries and (2) the possibility created by virtual elimination of competition from dollar areas of charging higher prices which soft currency areas might well be tempted to use to their advantage. This means that irrespective of the fact whether we deal with hard or soft currency areas, there was and is bound to be a rise in the rupee cost of equipment and services. So also higher costs involved in the appointment of the services of the firms of consulting engineers from soft currency areas became inevitable. An important aspect of this situation is that India's post-Independence devaluation did indeed strengthen the bargaining power of such firms.⁴

We shall conclude our study of the financing of river projects with special reference to Indian conditions with one important remark: the success of a river project depends to a large extent not only on the availability of finance for the river plans as a whole, but also on the availability of allocated finances for each individual project in time. India has had to learn many things from her experience in the field of corporation financing (such as, at the D.V.C.) and in connection with sharing of financial responsibility by respective States concerned

¹ *The International Bank for Reconstruction and Development 1946-53 (A Report)* — published by John Hopkins Press, Baltimore, 1954. Vide p. 124, Part III, Chap. 1.

² *Second Five Year Plan*, p. 355.

³ Refer *Annual Report of the D.V.C. for 1948-49*, p. 14.

⁴ *Ibid*, p. 16.

in projects where the interests of more than one state are involved. It is disheartening to see that the issue of inter-state financial responsibility *versus* control over projects continues to be a vexed problem even today. It is high time that we learnt a lesson for the future from our past mistakes.

CHAPTER III

THE BENEFIT-COST ANALYSIS AND RIVER RESOURCES DEVELOPMENT

The "Benefit-Cost Analysis" is a technique of economic evaluation of project proposals, originally developed and used in the numerous development projects in the United States of America. The technique, however, has been widely applied in the river-basin developments, power, reclamation and conservation. In the U.S.A. the Corps of Engineers, Department of the Interior, Bureau of Reclamation, Department of Agriculture, and the Federal Power Commission—all of which happen to be agencies of the Federal Government—adopt this technique in determining the criterion of investment. Stated in a different manner "Benefit-Cost Analysis" is a form of economic evaluation aimed at measuring the manifold economic effects, pro-developmental as well as otherwise, that result from a particular project. This practice of determining the profitability or otherwise of any enterprise by comparing as to which, the cost or benefit, is more, is nothing new. But the various processes and intricate details that fall under the analytical details were not even visualised in olden days.

Over the years, especially during recent decades, certain principles of resource development have emerged which may guide the formulation and evaluation of projects and programmes. Some of the principles are multi-purpose use—a real integration, minimum waste, wide diffusion of benefits, contribution to economic stability, sharing of costs and responsibilities and a few of the like. All these can be grouped under the concept of Benefits and Costs. The ideal behind the benefit-cost analysis technique is to account for all the effects from a social point of view with the ultimate object of determining that combination of resources which will result in the maximum net benefits to society. In the case of private entrepreneur, the relative desirability or otherwise of alternative investment proposals are made purely on some measure of profitability. The criteria for special desirability are different. It is widely accepted that both "tangible" and "intangible" costs should find a place in the index of social value.

At this point, it is necessary to point out that the components of the feasibility of a river project can broadly be divided into three, namely, engineering feasibility, economic feasibility and financial feasibility. Engineering feasibility may be judged from the possibility or otherwise of setting in a project in a particular place or basin. Financial feasibility is the test of a proposed project to determine whether the reimbursable costs can be returned by project beneficiaries. We

have to approach the study of economic feasibility on the assumption that both financial and engineering feasibilities do exist. By economic feasibility we try to test, as noted earlier, whether in a proposed project the anticipated benefits will exceed the estimated cost. The common denominator for this test is the value of benefits and costs in money terms. It would appear that the key to a favourable test is a benefit-cost ratio in excess of unity. The application of this test to a proposed (U.S.) Bureau of Reclamation project is illustrated by the following data for a multi-purpose river project¹ :—

Annual Benefits

I. Municipal and Industrial water supply	...	...	\$6,704,000
Flood Control	...	...	\$ 132,000
Fish and wild life	...	...	\$ 70,000
Recreation	...	...	\$ 89,000
Irrigation	...	...	\$ 532,000
Total Benefits	...	...	\$7,527,000

Annual Costs

Total construction costs	...	...	\$85,383,000
Interest during construction	...	...	\$ 8,538,000
Total investment	...	...	\$93,921,000
II. (a) Annual cost of amortising the investment at 2.5% over 50 years	...	...	\$3,312,000
(b) Annual operation and maintenance cost	...	...	\$1,005,000
Total costs (a) and (b)	...	...	\$4,317,000

Here the ratio of total benefits to total costs, of course, excluding the construction costs, is 1.7: 1.

The evaluation of river basin projects or programmes necessitates a complete analysis of their expected economic effects. These expected economic effects might be expressed in terms of benefits and costs. It is the provision of useful goods and services that are expected to flow in as a result of a valley development programme implementation that should come under the term "Benefits". Costs, on the other hand, are viewed as the value of those useful goods and services that are diverted from some alternative application and of any adverse effects resulting. If over the useful life of a project it generates benefits in excess of costs, both expressed to the maximum extent possible in terms of money, the project would be economically attractive. This indicates that the undertaking is adding more to the "Social Product" than is lost by the withdrawal of other resources from other fields of application.²

¹ *Reclamation in the United States*, p. 128.

² *Ibid*, p. 75

A benefit-cost relationship constitutes the economic criterion but in computing this relationship, consideration is to be given to all kinds of benefits and costs—social as well as private and indirect as well as direct.

The benefit-cost analysis of a river project programme involves the following important steps. First, we have to identify and measure benefits. The various patterns of benefits will have to be studied. Secondly, identification and measurement of all types of costs is necessary. Benefits and costs should be translated in terms of a fixed period of time. Lastly, *the benefit-cost ratio should be computed and benefit-cost relationship, including the intangibles, as said earlier, should be appraised.*

Let us try to show the break-down analysis of the various items of costs and benefits, and establish the definitions of each.¹ *Project costs* are the value of goods and services such as land, labour and materials used for the establishment, maintenance and operation of the project, including allowances for induced adverse effects whether these are compensated or not. *Associated costs* are the value of goods and services needed beyond those included in the cost of a project or programme itself to make the immediate products or services or the project or programme available for use or sale. For example the farmer's cost of producing the irrigated crop other than any charge for water would be associated costs. *Indirect or secondary costs* are the value of any goods and services (other than projects and associated costs) used as a result of the project. These include the costs of processing the immediate products of the project. *Intangible costs* are those which cannot be estimated in monetary terms.

Benefits may broadly be divided into direct and indirect. *Direct or primary benefits* are the value of immediate products of services resulting from the measures for which the project costs and associated costs were incurred. The market value to the farmer for products produced are primary benefits. The net primary benefit is the foregoing, less the associated costs. *Indirect or secondary benefits* are the value of increases in useful goods and services which accrue in the activities stemming from the processing of project output following initiation of project operation or induced by inter-departmental money incomes arising from increased employment during project construction. *Intangible benefits* are the ones whose value cannot be evaluated in terms of money. The various types of benefits that are derived from the developmental possibilities of a Programme of River Valley Development have already been studied in previous chapters and hence they do not merit repetition here. For purposes of illustration, let us observe the direct and indirect benefits derived from the Yume Project in the U.S.A.² which was constructed in 1910 at a cost of 9.7 million dollars

¹ Refer, *Water Resources and Economic Development of the West*, (Proceedings Committee on the Economics of Water Resources Development of Western Agricultural Economics Research Council Report No. 1) pp. 49-62.

² Ref. *Land Reclamation Programme in the U.S.*, Vol. I, p. 65.

to irrigate 69,000 acres of land. The following are the details of the data.

Direct and Indirect Benefits from Yume Project, U.S.A.¹

(i) *Annual return from projects*

1910-1916	...	...	\$445,000 to \$700,000
1947	...	...	\$14,000,000

(ii) *People residing on farms*

1912	...	...	1,500
1947	...	...	3,000

(iii) *People residing in towns*

1912	...	...	3,150
1947	...	...	30,000

(iv) *Car-load shipments of farm commodities from the Project area:*

Prior to 1917	...	300
1946 and 1947	over	17,000

(v) *Business gross income:*

1939-46:	...	\$21,000,000 annually against \$6.5 million dollars annually previously.
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(vi) *Post Office receipts:*

1921	...	\$ 22,000
1943	...	\$161,000
1946	...	\$191,000

(vii) *Expansions in the use of modern conveniences since 1925:*

Telephones	...	...	increase by 160%
Gas connections	...	...	increase by 116%
Water connections	...	...	increase by 107%
Electrical connections	...	...	increase by 62%

(viii) *Federal Taxes paid directly or indirectly from the project:*

1931-1947	...	\$37,000,000 \$ 2,660,000
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We shall now proceed on the assumption that identification of both benefits and costs in a river project is possible. We shall deal with the problems of measurement of benefits and costs later. To analyse the future benefits and costs, apart from identifying them, it is necessary to measure what actual benefits and costs will be over a selected period of years. The annual cost of owning and operating a project over its expected life is the equivalent of the project capital cost and the annual operation, maintenance and replacement expenses. Then the economic justification of a project is to be ascertained from the comparison of average annual costs with the average annual benefits with due allowance for intangible benefits and costs. The annual cost for economic analysis will consist of the following items, namely, annual

¹ *Report on the Yume Project* — (Report to the Committee on Public Works by the Sub-Committee to Study Civil Works), pp. 87-94.

equivalent of capital cost (interest and depreciation) and operation and maintenance including replacements. In making an economic analysis, it is essential to use the interest concept, whether funds for a project are received from loans, grants or appropriations. The interest and discount rates provide a means of making an allowance for the difference in time and rate of accrual and the degree of certainty of occurrence. By this the values connected with benefits and costs at their expected time of accrual can be made comparable. Regarding the rate referred to above, it would be generally appropriate to take the average long-term borrowing rates of government offerings. Even for funds from foreign loans the long-term rates applicable there would suitably be applied. It is also necessary to consider the element of depreciation that takes place due to the unavoidable loss in service value of a project due to wear and tear not covered by current repairs, the obsolescence or inadequacy resulting from many factors like discoveries, change in public demand, etc., and losses suffered through the destruction of property by extraordinary casualties. In the case of a reservoir, for example, the rate of silting can be cited as an instance. There are several methods of computing depreciation. It may be the "sinking fund method", "the straight line method" or the simple estimation of the life of each item in a project. The "straight line method" consists in dividing the original capital cost of the item by expected years of economic life and assuming that this amount is to be placed in a fund annually. The sinking fund method is correct for use in economic studies in that the interest earned by the fund is credited to the fund. Whatever be the method adopted the maximum period of analysis should be the economic life of a project but should not exceed 100 years.¹

In projects where actual benefits and costs do not occur uniformly, the usual practice is to reduce their values to a common time basis applying the necessary formula and to ascertain benefits and costs. For our purposes, however, it is not necessary to enter into the mathematical and arithmetical details of the necessary formula and it is sufficient to know that benefit-cost ratio can be calculated.

But, how can we make the best use of the estimates of benefits and costs? Should it be desired that an Authority may build only economically justified projects and the highest social value for money, it follows that schemes cannot be approved unless they produce at least as much benefits (social values) as they cost. This might well apply to the single-purpose as well as the multi-purpose projects. Mr. A. N. Thompson of the Bureau of Reclamation of the United States has opined that the most effective use of resources in a river valley project can be made if they are utilised in such a way that the amount by which benefits exceed cost is a maximum as against a maximum benefit cost ratio.² We may, however, note three important

¹ For an analysis of this problem, see *Resource Conservation, Economics and Policies* — Ciriacy Wantrup, Chapter 17, full.

² This opinion was expressed at the U.N. Conference at Lahore on Resources in Underdeveloped Countries, referred to elsewhere.

points in this respect for an economically justified project, namely: (a) the point where the ratio of benefits to costs is unity, (b) the point of maximum excess of benefits over costs or maximum surplus, and (c) the point of maximum ratio of benefits to costs.

We may now consider the problems of measuring benefits and costs. The problems of measurement of benefits and costs are manifold indeed and in many cases the measurement is an arbitrary matter. There is the problem of deciding what particular set of price and cost estimates are to be used for future years in arriving at reasonable monetary estimates of benefits and costs. There are difficulties concerning the rate at which to discount future benefits and costs in order to arrive at comparable present values. Estimates of net benefits for public projects such as river basin management, flood protection works and the preservation of scenic values, include a broader range of benefits and costs. There is a general agreement that benefit-cost analysis is subject to many weaknesses. There is also the recognition that benefit-cost analysis has been distorted and abused. Some have even raised grave doubts regarding the advisability or otherwise of this technique of evaluation. This challenge has been met from various angles. Some regard benefit-cost analysis as a waste. Others feel that economic measurement being allegedly static, understates the induced benefits. Benefit-cost analysis thus tends to hold public resource development at a lower level than is desirable. Still others fear that inflated benefit-cost ratios may be a pretext for the government to propose projects that are economically unsound, so as to satisfy some sort of pressure groups or others. Alternatively, if the projects are economically sound they should be paid for by the beneficiaries. Some even go to the extent of saying that willingness to pay on the part of the beneficiaries should be made the criterion for river valley development. It is widely felt that the benefit-cost analysis by governments appears worthwhile in spite of its weaknesses, its risks, and its relatively small influence upon the course of events.

Perhaps the thorniest problem in the evaluation of resource projects and programmes is to determine which of the variety of costs should be considered and estimated as a basis for deciding which projects and programmes to pursue. At the first glance, one portion of benefits and costs appear rather obvious and simple to evaluate. Such items are usually called "tangible" to which reference has already been made. We may cite an example here: the value of sugarcane or cotton produced by an irrigation project and the costs of the cotton or sugarcane, the dam and the productive agricultural areas flooded by reservoir, are determinable and they come under the category of "tangible costs and benefits". On the other hand, if the project water is used to rehabilitate wintering grounds for water fowl, if certain dams interfere with anadromous fisheries, and if a reservoir floods certain hilly areas creating an impressive scenery, the benefits and costs of those are not easily calculated and they may be classed "the intangibles". Even in evaluating the tangibles, one should recognise the difficulties created by the fact that the functioning and result of a

price system itself are profoundly affected by aggregate income, income distribution and market form. These in turn are affected by a host of social institutions having an important and highly complex status in individual preference systems. Again, in evaluating water resource development, one might wonder at the undue emphasis that is generally laid only on the price of cotton or sugarcane, rejecting or mainly ignoring the evaluation of recreational opportunities or new scenic beauties as belonging to the field of meta-economics.

From the above, it should not be misunderstood that the benefit-cost analysis of "intangibles" should be given up. Certain general aspects of benefits and costs having to do with public welfare, national defence, public health, and economic stability are difficult to estimate in precise pecuniary terms. Even more specific aspects such as recreation, fish and wild-life preservation and the enhancement of historical and archaeological features defy precise quantitative measure. In these cases only the roughest kind of quantitative estimates of such benefits and costs seem possible. These aspects which have been termed as "intangibles" are obviously real and of overriding importance. They cannot be left out of account in the final selection of projects and programmes despite the fact that they do not offer proper quantitative measurement. The best approach seems to me to identify all those benefits and costs which can be estimated in terms of money reasonably well, and to make most careful and systematic estimates possible of them. For those aspects which cannot be estimated with reasonable satisfaction in terms of money, other forms of appraisal should be used. Even for these aspects, however, monetary estimates of benefits and costs sometimes can be used as rough indicators of their value to users and of the cost which may be justified in developing them. The problem is to make decisions as to the degree of reliance in project selections and evaluations which shall be placed upon monetary evaluation as compared to other forms of evaluation.

Yet another type of benefits and costs other than the "intangibles" and the "direct" is the secondary benefits and costs which flow indirectly as a result of resource projects and programmes. Let us illustrate this by an example. The irrigation water provided for the farmer results in an increase in his net income. This is direct or primary benefit. In addition to this, as the increased agricultural production resulting from additional irrigation finds its way into channels of distribution and processing, there comes an increase in the net income to various distributors and processors along the line.

The problem of direct and indirect costs are most often confused with that of "tangibles" and "intangibles". The terms "indirect" and "intangibles" are used most often interchangeably though there is little relation between the two. We may adopt here the definition and terminology of the Sub-Committee on Benefits and Costs of the Federal Inter-Agency River Basin Committee.¹ According to the Report,

¹ Sub-Committee (U.S.A.) on Benefits and Costs, "Proposed Practices for Economic Analysis of River Basin Project" pp. 8 and 9.



45449

... the value of goods and services needed for the establishment, maintenance and operation of the project and to make immediate products of the project available for use or sale. "Direct benefits" are the value of the immediate products and services for which direct costs were incurred. "Indirect benefits" are the values added to the direct benefits as a result of the activities "stemming from" or "induced by" the project. Indirect costs are the costs of further processing and any other costs "stemming from" or "induced by" the project. Many kinds of secondary benefits and costs are considered in the Sub-Committee Report and in other literature related thereto.¹ These secondary benefits may broadly be classified into those "stemming from" and those "induced by".

Under competitive markets, net benefits arising from processing quickly find demand from processors for the immediate products of a project. In connection with public resource development, a demand function may be identified with marginal benefit function. An estimate of the demand function for the immediate products of a public project is the most essential basic step in considering primary benefits.² Therefore, if by some more or less arbitrary accounting procedure secondary net benefits from processing are determined and added to the primary net benefits, a portion of the primary benefits is counted twice. In arriving at secondary benefits it has become customary to apply standard percentages to primary benefits. These percentages are derived from the statistics of average values added in processing. Thus for cotton and jute and other industrial raw materials produced by a public irrigation development, the percentages are higher than for livestock products.³ Such identification has practical significance as a preliminary step towards broadening the repayment base (which is rather narrow if continued to the limits of primary benefits), towards obtaining dependable repayment contracts from groups of beneficiaries and towards making special taxes socially acceptable.

A very interesting point raised in connection with secondary benefits is that the goods produced by a river project may lower market prices. This is true to some extent. People do argue that since immediate products are available to processors at lower prices the project then should receive a credit for secondary net benefits equal to the price differentials times the quantities produced. The quantities

¹ (a) The Sub-Committee Report

(b) Secondary or Indirect Benefits of water use projects, p. 63. (Report of the panel of consultants to Michael W. Straus, Commissioner, Bureau of Reclamation, USA)

(c) "Economic Evaluation of Federal Water Resource Development Projects", p. 55.

(d) Reports and Budget estimates relating to Federal Programmes and Projects for Conservation Development or use of water and related land resources, p. 20, and a few of the references cited on previous pages.

² For more details see Ciriacy Wantrup, *Resource Conservation, Economics and Policies*, ch. 17.

³ *Ibid.*

produced by a public project may be large enough to have effects on prices. Such additional profits are short-lived. The quantities produced by the project should be evaluated with prices at which these quantities can be absorbed. On the other hand, the project should not be debited with the effects of price-decreases of inter-marginal quantities, i.e., of quantities that would be produced without the project. Such price effects of a project both through products supplied and services demanded are transfer items among producers and consumers that should not be considered in benefit-cost analysis for purposes of project selection. For purposes of repayment on the other hand net income resulting from such effects may be considered as secondary benefits in industry or regional accounts.

After our somewhat detailed consideration of the problematic aspects of benefits-costs analysis, namely, the intangibles and secondary benefits and costs, let us pass on to a study of primary benefits and costs. In fact it is primary benefits which are all important in the project feasibility determination. The best study is made by the evaluation of costs and benefits on an annual basis expressed in monetary terms. As has been stated earlier, the capabilities of a river project include irrigation, power production and transmission, flood control, recreation and fish and wild life propagation. The primary benefit due to irrigation is the market price of all the crops to the farmer less the associated costs in producing these crops which include the increased operating costs of production, interest on increased farm investment, cost of preparing the land, maintenance, depreciation on equipment, property taxes, family living expenses and other associated costs. Any adverse effects due to increased crop production (for example, the fall in prices of cereals) should be evaluated to scale down the primary benefits. The benefit from generation and transmission of electrical energy can be taken as the fair market value of that energy based on local regional values. From this should be deducted the associated costs to deliver power including costs of facilities plus their annual operation and maintenance costs and cost of replacement of parts. In certain special cases of new industries, etc., there may be increased electrical load requirements. Such industries could have been started only if low cost power was available. This, the river projects could supply. In such cases the benefits of power would be, saving in cost of power over the cost by least alternative means, it appears. Again, river projects which include measures for flood control provide benefits in two ways mainly (a) by the prevention of loss of goods or services which would otherwise occur from floods and (b) by the possibility for increased production of goods and services through more intensive use of real property by the removal or reduction of flood hazard.¹

Now let us pass on to a study of project costs and associated costs which do not present much peculiar problems. These are based mostly on known quantity factors. The selection of proper price levels for labour supplies and materials over the period of construction of

¹ Detailed analysis in this respect is contained in a subsequent chapter entitled: "Economics of Flood Control".

projects can more or less be made from a study of the price trends. While all problems associated with the determination of project costs should be treated with judgment and care, too much emphasis cannot be placed on the need for adequate physical data concerning factors that determine the location, type and scope of project features. This actually refers to the authenticity of all surveys and explorations which have a definite relation to the determination of project cost.

It is now for us to deal with some very common place observations in regard to the factors to be borne in mind in the process of the measurement of benefits and costs. In expressing benefits and costs in terms of monetary units, we will have to consider the nature of price levels, investment costs, operation maintenance and replacement costs, benefits in terms of *ex-ante* prices, interest and risk allowance, and most important of all, the selection of the period of analysis.

First of all, let us take into consideration the factor of price levels. As far as the cost part of benefit-cost analysis is concerned, the determination is not so difficult, for the price levels of various aspects of investment are known quantities. There is no element of guess-work coming into the picture at all. This part can be determined fairly accurately. But the snags come in when we have to convert the benefits expected to accrue during the life time of the project. Nobody can say with accuracy the likely trend of prices that might prevail during a period of 100 years which is the average efficient working period of a project. There is bound to be some inaccuracy creeping in here. But assuming that international situation remains mostly undisturbed, an average price level that might prevail may be predicted fairly accurately. Direct or specific allowance should, however, be made for interest and risk if these are closely associated with future benefits and associated costs. As in most countries river projects are financed by government agencies, the interest rates to be considered, as noted earlier, should be calculated on the basis of long-term government bonds. Interest may be reduced to an annual basis to facilitate the computation of annual costs and benefits. Risks referred to above may be classified as predictable risks and unpredictable risks. In the case of predictable risks a reasonable amount of money may be earmarked to cover the losses and this should be either added to or deducted from the cost or benefit after the sum has been reduced to annual basis. In the case of unpredictable risks evaluation depends mainly on judgment.

The economic life of a project is necessarily much less than the physical life of a project.¹ It is even better to take a period shorter than the economic life for purposes of benefit-cost analysis as it provides for an allowance for the risk factor and to difficulties associated with the estimation of the value of remote effects. It is estimated that the economic life of a project, as noted above, is about 100 years. Sometimes it may be shorter. No period more than 100 years, be it repeated,

¹ Here the case of the destruction of entire project in its early working periods by bombing (as during a war), by engineering and constructional defects, etc. are not considered.

need be considered.¹ The amortisation charges should be sufficient to cover capital investment during the period of analysis calculated on a sinking fund basis using the investment costs and interest rates. Except in very special cases, the basis for estimating benefits and costs should be under the assumption of maintaining the project at full operating capacity.²

Having thus examined the various implications of the Benefit-Cost Analysis Technique, we may conclude that this appears to be a most sound—if not the only—method of evaluation as far as river projects are concerned. It may be repeated that economic and mathematical exactitudes are out of question in an evaluation of both tangibles and intangibles. The fact remains, however, that it is not the technique as such that is to be criticised but methods of actual evaluation of various items. In this context, it must be admitted that in spite of its shortcomings, there are potentialities for improvement and it is these potentialities that strengthen the case for the use of the technique all the more.

Finally, we may observe that in the determination of total “output” between consumption and investment any economy depends on a comparison between costs and benefits of investment. Even though we may be unable to quantify all benefits and costs, a proper listing of the factors which must be considered should prove useful to those concerned with national investment policy and planning. “No matter how difficult the task of equating the costs of adding to capital with the benefits explicitly or implicitly, we must do exactly this in order to reach a decision.”³

CHAPTER IV

THE BENEFIT-COST APPROACH IN INDIA'S RIVER PROJECTS

It was made clear in the previous chapter that the proper level of investment must be determined in a fairly arbitrary fashion. There are no set formulae which may enable planners and policy-makers to make decisions without making value judgments and speculations about future. Before we set out to identify the actual problems of measurement of benefits and costs in India, we will have to be very clear regarding some fundamental points. The idea of planning river and river basin resources is fairly new to India as was already stated. In the United States of America where the idea of unified development of river basins originally took shape in concrete form, the planners have been facing these problems for a number of years and now they

¹ This is the view expressed by the Inter-Agency River Commission of the United States of America.

² *Formulation and Economic Appraisal of Development Projects*, p. 125, vol. 1.

³ *Economic Development — Principles and Patterns*, p. 149, From an article “Formation of Capital” by John A. Butterick.

have reached a stage where the computation of benefit-cost could be made with a fair accuracy. But that is not the case with India. She has embarked upon her river resource development actively only after the achievement of Independence and with greater speed during the First Five Year Plan. Prior to this there had been attempts—and some very commendable too—to develop her river resources, but in a manner which was isolated rather than integrated. These attempts were mainly in the field of irrigation; and private interests had their say in the construction and maintenance of irrigation canals and irrigation reimbursement. There was total absence of a proper benefit-cost study in resource development in pre-Independence India.

The idea of benefit-cost analysis is just new to India. It is against such a background that we have to diagnose the problems of benefit-cost measurement in this country. From the above it should not be mistaken that none of the irrigation projects yielded adequate social benefits in the pre-Independence era. What is sought to be conveyed is that the number of projects in which private gains exceeded social benefits were more than those in which social benefits exceeded private gains. If at all some benefit-cost idea was considered in the case of some of the projects, it was not given due weight, and political considerations weighed too heavily. If at all some proper investment came forth, (for example in South India) it was only by some accident or coincidence.

Addressing the 24th annual meeting of the Central Board of Irrigation and Power, in October 1953, Sri V. T. Krishnamachari, Deputy Chairman, Planning Commission made some very important observations, which it is considered pertinent to be quoted here. He observed:

“When you bring in the conception of indirect benefits, there is no knowing where to stop. What are the benefits which you want to take into account? With the help of water available additional crops are grown. In this the agriculturalists have to incur additional expenditure. This should be set off when you speak of indirect gains. Similarly the use of power generated calls for large capital outlays. This has to be allowed for ... The conception remains that we have two sets of projects which have to be constructed for protecting scarcity areas whether they are directly remunerative or not”.

The above extract from the speech of the Deputy Chairman, Planning Commission, spells out two fundamental points: (1) the place and adequacy of the benefit-cost analysis approach, and (2) the guiding principle of project selection. It appears from the above that there is no set principles for the project selection. Sometimes it might be the monetary remuneration that decides the fate of a project, sometimes the protection of scarcity areas. Not infrequently, political considerations also are given heavy weight.

We may, however, take into consideration a very one-sided but seemingly pertinent stand taken by Shri J. C. Kumarappa regarding the economics of river projects. Taking the Damodar Valley project as a case study, Shri Kumarappa says that the project estimated to

cost round about Rs. 28 crores would produce 2,00,000 K. W. of electric power per hour. According to his calculation, this energy would work 29.2 crores of 1 H. P. engines for eight hours. He calculates that this would be equal to 8.0 lakhs of adult workers. Damodar Valley Project expenditure forms nearly 10% of the River Valley Development scheme. Hence the full developmental schemes would go to approximately ten times the figures shown above. This is the number of labour displaced due to the new projects. He says, "All this in fact means bringing into existence a fresh lot of unemployed people, putting out of work as many existing ones. If we can shoot them all down then there would be less objection from the humanitarian grounds as otherwise we shall have to starve them to death." It is quite evident that the above viewpoint is somewhat superficial. But, the question is that in the formulation and construction of a river project, whether in the calculation of costs both indirect and direct, the economic imagination should be carried so far as is done by the eminent Gandhian economist. The above may be classed under the head "Social Cost". Yet another question is as to what should be the basic philosophy of planning that we should bear in mind when we calculate the benefits and costs.

This leads us to a very fundamental question: the concepts of costs and benefits, both direct and indirect, have different significance and contents in socialist and capitalistic economies. The concept of social benefit is much different in a Gandhian or Sarvodaya order of society, *the meaning of "welfare" differs from a communist or capitalist economy.* Now, in calculating the benefits and costs in India, what should be the yardstick that we should actually use? It may be stated that so far, our river valley planning and its accounting are strictly following the American pattern. *But, benefit-cost analysis technique is not to be looked upon only as a profit and loss technique. We have to reckon our benefits and costs in terms of labour and human welfare.* We have to take into consideration all other repercussions of our economic organisation in the social framework.

Bearing the above points in mind, we pass on to a study of certain fundamental difficulties experienced in the measurement of benefits and costs in India.

We may first of all take the cost aspect of the benefit-cost measurement problem in India. In countries where unemployment and under-development are too glaring, an accurate measurement of costs (or of benefits) is exceedingly difficult. The very essence of cost is the giving up of or going without some other benefits. Most of these costs can be to a large extent expressed in terms of money. But as was stated in the previous chapter money costs do not always reflect accurately the benefits foregone. Perhaps in a developed country where capital resources are not scarce the actual costs may be measured without entailing much error of judgment. But in India the capital value or cost of the diverted resources would vary according to the various uses to

¹ J. C. Kumarappa in *Sarvodaya*, January, 1955, Vol. V. No. 7.

which they can be put and this makes the task of measurement of this aspect of the cost extremely problematic. To put the problem in other words, we meet the problem of wide discrepancies between private and social costs. Let us take, for example, the aspect of labour. It is well known that Indian labour remains unemployed or underemployed for a considerable number of days in a year. It is evident that where these problems of unemployment and underemployment exist simultaneously, accurate measurement of social costs becomes exceedingly difficult.

In India in certain respects, money costs may understate the social costs of a project. It is generally recognised that "consequential" damage to property is a part of the cost of the project even if the construction agencies are not required to pay for such a damage. Apart from that a scheme may use up substantial amounts of goods and services which have a price less than their opportunity cost. The most important of these items is foreign exchange. In India, in recent years especially, foreign exchange is scarce and the price at which the project authorities obtain currency for the purchase of foreign equipment and materials may be too low to be taken as a measure of the social costs of imports. In India the planning authorities make allowance for the scarcity of foreign currencies by giving preference to schemes which rely, mainly, on domestic resources. This is the trend in recent times at least, when the very success of the second Five Year Plan itself is threatened, because of unexpected bottlenecks in the flow of foreign exchange and difficult conditions arising from the deteriorating export position. The above-mentioned preference could be expressed quantitatively in benefit-cost analysis using the market rate of exchange if that differs from the official rate though it is clear that it could be settled only at a higher level.

Another important problem that comes up in this connection is the problem of interest. In India, public investment funds are usually distributed by administrative decisions and the rates charged to constructing agencies are more or less arbitrary. Capital markets are not fully developed, and there are few market data from which an appropriate interest rate can be determined without ambiguity. But whatever rate is chosen as an abstract expression of the attitude towards the present and future income, this rate should be applied generally for economic analysis although some projects or project functions may be financed more cheaply than others or even free of interest. Such preferential rates represent or should be looked at, as subsidies. Unless, however, they are shown separately, and only in the financial or reimbursement analysis, attempts to assess the economic performance of different schemes will be confused.

We may now pass on to the benefit aspect of the problem. It has been already pointed out in our discussion on benefit-cost analysis that the social purpose and benefits which users derive from goods and services provided by a river project, determine the project value of the output. The main problem that is to be faced in India is the element of time and uncertainty in Indian agriculture which might still

remain even after the implementation of river projects. Uncertainty due to drought might not be there, but uncertainty may be created by excessive and untimely floods, which will have their effects on agricultural production. The cost of agricultural produce tend to vary according as the general trend of farm produce the world over. Hence we cannot arbitrarily compute the likely benefits much in advance, accurately. This is a problem peculiar not only to India but to many other countries as well. In the case of large, developed economies like the USA, however, this problem does not quite arise largely, because of huge buffer-stock arrangements. Hence in countries like India, in so far as the estimate of future benefits is based on the present price, a subsidy must be added to it. But the problem is: how much and what should be the variation in subsidy?

Apart from the main benefits like flood control, irrigation, hydro-electricity, etc., which go to augment the physical production, river projects in India might increase the real income or welfare through many other ways of satisfying consumer needs. We might point out the case of domestic water supply. It is a fact that over the vast areas in India, domestic water supply is still an unheard of thing. If and when these benefits start flowing from a project, how to measure them is a problem. Even the most calculative economic acumen cannot foresee in advance a complete picture of the likely benefits.

Even in the field of determining project priorities the difficulties in the measurement of benefits present problems. In a country like India the main benefits from river projects come in the form of "intangibles". For example, in a project like Kosi mainly intended for the reduction of flood havoc it is the "intangibles", which cannot be measured, that are of primary importance. In the western countries, notably in the U.S.A., two schools of thought exist: one which insists on minute monetary evaluation of the likely intangible benefits, and the other which says that intangibles need not be brought into the picture at all. The measurement of intangibles present huge problems in India. It is not yet known as to whether intangibles should be evaluated for inclusion in the benefit-cost analysis in Indian river planning.

Let us now consider the indirect or secondary benefits. Indian agricultural statistics are woefully inadequate to evaluate the beneficial goods and services, which accrue in activities stemming from the processing of project output following initiation of project operations or induced by incremental money incomes arising from increased employment during the construction of projects. The economic conditions, as they might be expected to appear with and without the project in India's riverine areas, are difficult even to imagine, let alone their accurate evaluation.

For purposes of benefit-cost analysis in India it might be appropriate to use a wider concept of intangible and secondary benefits. In the full description of the role which a project is likely to play in the economy of any region, be it the Bhakra Nangal, or the Damodar, it should include a wide range of induced activities as markets are created,

additional consumer services are required in the community, and economic activities multiply. Indirect effect in a still wider sense will have to be considered when the size of the development programme, which India can support and the ways it should be financed are under discussion. These provide real problems of measurement.

Summing up our discussion, we find that benefits and costs to be estimated in order to obtain an indication of the relative effectiveness of various schemes are extremely difficult to measure in an under-developed country that is India, primarily because of unbalanced economic growth and secondarily because of economic instability and disparities which exist and which might prevail in future. An estimate made in India cannot claim to have an extremely high degree of precision. They are not, however, "do-withouts" for the formulation of river plans in India. Problems of measurement might lead us to some degree of over-estimation or under-estimation but the fact remains that in the absence of alternate techniques of evaluation we have to accept the benefit-cost technique for all its imperfections. The conflict between economic evaluation and social benefit evaluation is bound to remain.

CHAPTER V

THE PRINCIPLES OF COST ALLOCATION

The cost of a river project is an important factor in the selection and implementation of a river project. In a single-purpose project, "costing" does not provide problems. But that is not the case with multiple-purpose river projects. H. A. Morgan, one-time Chairman of T. V. A., said "... the cheapest power, the cheapest river transportation, and the cheapest flood control is which results where all three may be combined in structures in which a substantial portion of the expenditure may be divided among these functions."¹ The statement of Mr. Morgan mentions exactly the very basic principle on which all allocations of costs of multiple-purpose projects are made. More clearly stated, an allocation of cost is made by examining all facets of a project to arrive at a fair division of costs among the functions of the project. The allocation should be such as to allow each function of the project to share equitably in the substantial result flowing from the cost of joint or common facilities in a multiple-purpose project. The main problem is how and where to fix the apportioning costs of joint facilities to the project functions.

For each multiple purpose of project, however, there are always some items of costs of joint facilities which make the project possible. The appropriate division of the part of the total cost among several project facilities according to purpose or use in addition to the respective direct costs is known as allocation of costs. The allocation of costs

¹ Letter to American President, dated June 9, 1938 printed in Historical Documents 709, 75th Congress 3rd session.

is necessary for practical purposes, ranging from simple returns on investment to various complicated aspects of reimbursement. If charges are to be made on the basis of cost for all functions or as a matter of fact for any function (say, for example, power), it is necessary to apportion costs among various project services. There is no problem here as far as separable costs are concerned which might include a part of the overhead, even where these arise from common services.¹ But in most cases, as has been mentioned, there will be joint costs which are to be allocated in one way or another. The most logical and equitable way, it appears, would be, in general, to levy this on various services in some relationship to benefits and costs. It would be thoroughly illogical to recommend cost allocation on a basis related to benefits, and then use sales revenues from the project as the measure of benefits. Therefore, it becomes quite clear that the purpose of allocating costs is to spread project costs according to the functions provided or served. It seems that "equitable allocation of costs will result if the benefits or the cost of accomplishing the same purpose by alternative means and if the allocation to a purpose is not less than its separable cost."²

With this much of general observations, we shall pass on to various practices used in the allocation of costs. It is to be specially mentioned that in the United States of America where multi-purpose river basin developments have been and are being implemented, detailed studies have been made in this respect. In India we are mainly following these methods as there is little else to explore. Several methods of allocation of costs of projects are available to us. No method might claim perfection, for each has its merits and demerits varying with application to particular cases.

Let us first of all consider the "Alternative Justifiable-Expenditure Method." This method provides that the cost of the alternate single-purpose project or the maximum justifiable expenditure whichever is less, be taken as the relative value of cost assignable to a single purpose. Let us make the idea more simple. This method is based on the estimated cost of a possible substitute single-purpose facility in the area which would provide benefits equal to those of the multi-purpose structure but as a single purpose such as irrigation or power. The costs of multi-purpose facilities are apportioned on the basis of the difference between the total cost of an alternative single-use facility and the cost of the facility for that use in a multi-purpose project. Such differences for each function are to receive a share of the total cost as compared with the total of all differences for the various functions in a multi-purpose project.³

The accurate use of this method is very exacting indeed. The most important fact is that sufficient data should be available to com-

¹ Federal Inter-Agency River Basin Sub-Committee on Benefits and Costs. "Proposed Practices for Economic Analysis on River Basin Projects" (Washington DC. 1950), p. 54.

² *Manual of River Basin Planning* — U.N. Publication, p. 47.

³ For illustrations, Vide Golze, *op. cit.*

pute the cost of substitute facilities with reasonable accuracy. In most cases, it will be found that much field investigation is to be undertaken to get adequate information for this purpose. Nevertheless, the alternative-justifiable-expenditure method is one of the best methods of cost allocations. In most cases, it has been found in the United States that, as a result of the use of this method, a multi-purpose project can provide services more cheaply than individual single-purpose projects and that costs assigned for a purpose do not exceed the value of service.

Another method used for the allocation of costs is the "Priority-of-Use Method."¹ This method lays emphasis on the fact that because of some special circumstances that may be peculiar to a river basin, one or more functions of a river project may have a priority in its or their claim for more space in a basin plan. In the proposed Aswan Dam in Egypt, it is irrigation and hydro-electricity that have high priorities; in the Kosi project it is flood control. Therefore, wherever a recognised priority for a particular purpose exists, it is to be counted as an important factor in allocating the joint costs of a project. In applying this method, the costs of facilities required for carrying out project purposes are assigned to each project function. With due attention to the priorities, division of residual costs are made. Let us clarify with the aid of an example. Priority in a project might be given to one use, say, irrigation, and other uses such as power and navigation, second and third places respectively, in order of priorities. The water use in this case will first of all be made to satisfy the irrigation need and then only for power and navigation. However, if there are water releases serving two or more functions in common such as navigation and power and have the same priority, the share of the cost which water-uses present may be termed, in technical language, as a "priority within the priority group". Priority of use in itself does not and need not always provide a means of dividing joint costs. But it provides an important pointer in the process of dividing joint costs by other methods. Generally, the priority of use method is used on a comparative basis with the alternative-justifiable-expenditure method. The main defect (if the priority-of-use method is used alone) is that it allocates costs to high priority uses first and may not assign a fully evaluated cost to low-priority purposes. In a way, however, this is not a defect as projects of multi-purpose nature would be expected to provide for top priority uses first and foremost. The Bureau of Reclamation in the United States of America, it may be pointed out, averages the results of cost allocations obtained by the alternative-justifiable expenditure method with those obtained by priority-of-use method. This practice of the U.S. Bureau of Reclamation seems to be ideal for Indian conditions for practical purposes, in view of the fact that our finances are not

¹ Since the purpose of our study is only to have a general examination of the methods of Cost-Allocation that are generally used in River Planning it is not necessary, it is assumed, to discuss long-drawn-out accounting practices to illustrate the application of the various methods.

much and that we need speedy reimbursement from our projects. The fact is also to be borne in mind that we have launched a number of multi-purpose projects all over the country.

The next method that we are to consider is the "Benefits Method". According to this, the joint costs of a multi-purpose project is divided in proportion to the benefits received by each functions of the project. This necessitates the benefits to be expressed in "common denominator", in economic value, preferably in money terms. This method also makes two assumptions. The one is that it is possible to evaluate the benefits from irrigation, flood control, power, etc. in terms of money. We have already seen the numerous problems that arise in the monetary evaluation of benefits. The second assumption is that it is justified and equitable to allocate costs of joint facilities on the basis of expected benefits. It is not necessary to explain here as to how benefits can be monetarily evaluated as we have already examined this in detail. The next step is to determine the ratio of benefits in monetary terms with the total costs — which are treated as joint costs here in this case — incurred in the project. This ratio naturally would indicate the share of the cost of joint facilities of the project that is to be borne by each use which the project provides. It is a requirement of benefit method that specific costs which only serve one purpose of the project should be charged entirely to that purpose and that a share of the benefits found by dividing the cost of joint facilities should be credited to the single purpose. One fundamental limitation of this method is that the allocation by the use of it should not exceed the cost of producing the benefit by an alternative means. In case the two costs become equal, it is tantamount almost to the alternative—the justifiable-expenditure method.

Let us now pass on to the examination of yet another method, namely, the "Use-of-Facilities Method". Under this method, costs are allocated on the basis of the *amount of use of the facility* for each purpose of the project. More clearly stated, this method assigns a share of the cost of joint facility such as a dam, or a canal, proportionate to the respective uses of the joint facility. In the case of a canal, the use can be measured by the length of the canal which goes through the irrigated areas and provides for navigation. In the case of a dam, its uses can be measured by either the capacity of the reservoir or the amount of water released. The chief value of this method is that it leads to estimating the prospective uses and the extent of it. But this method has a grave defect. That is, the extent of uses to which the facilities may be put, changes from time to time and depends upon the operative mechanism and its efficiency. "The amount of use of facility" is a very relative term and sometimes would appear truly vague.

Another method may also be considered, known as "Equal-Appportionment Method". This method as the very name itself suggests demands the cost of joint facilities *to be divided equally* among the various purposes to be served by a project. This does not seem to be reasonable. Perhaps this method can be used only on the assumption that each feature of a multi-purpose project should share equally in

costs. To be reasonable, such an assumption should be supported by a cost analysis showing at least approximately that equal costs are incurred for each functional purpose of a project. This method might be used if an arbitrary decision can be taken that there is absolutely no reason for charging one purpose of the project with more of the cost of joint facilities than any other purpose. This method, no doubt, is very easy to apply, for this implies only a division of the costs of joint facilities into equal portions. Without a very minute analysis of relative benefits, it is not advisable to use this method since it would otherwise lead to assessing a project purpose with costs greater than benefits which might lead, in turn, to a feature to be uneconomic and unjustified, both from the execution and reimbursement points of view. This method has only theoretical significance and is seldom used in the allocation of costs in multi-purpose river basin development.

Of the various methods of cost-allocation that come under the ambit of our examination, the last one is the "Vendibility Method." This method is based on the relationship between joint costs, joint products and their pricing. "Joint products", to quote Alfred Marshall, "are things which cannot easily be produced separately but are joined in common origin . . . such as beef and hides, wheat and straw."¹ The market price of a joint product is determined by the general conditions of demand for and supply of the particular joint product. The long-run normal price of joint products offers a rather baffling problem, because long-run normal price depends largely on costs of production which, for joint products, can be determined only within wide limits. In the first place, the sum of the prices of both or all of joint products, derived from a common parent product, must equal the average total costs of producing the parent product, and it cannot be more than this according to the general principle governing price. In the second place, the long-run normal price of *any one* joint product under conditions of perfect competition cannot exceed the cost of parent product. In the third place, the price of a joint product whether competitively produced or not obviously must not in the long run be below the direct cost of processing it, for if it is, the material from which it is made will be thrown away.² It is to be remembered in this connection that when it is possible to vary proportions in which two joint products are produced, we can find the cost of one in terms of the other. The Vendibility Method of dividing joint costs is based on the theory that under conditions of perfect competition, a producer of joint products will so arrange output that long-term revenues from joint products must at least equal the fixed cost plus the variable cost of the combined output. The Vendibility Method is worked as follows: firstly, from the revenues obtained (or expected to be obtained) from each project feature, the specific cost incurred for that feature is deducted. Secondly, the remaining revenues from the above are capitalised at an appropriate rate of interest. The revenue obtained from the second point mentioned

¹ Alfred Marshall, *Principles of Economics*, 8th Edition, p. 338.

² *Economics* by John Ise, pp. 286-287.

should equal or set a ceiling on the amount of the cost of joint facilities to be assigned to a particular feature. The vendibility method is used by private businessmen so as to set prices which will yield costs of production plus a profit. But this method fails as a method for dividing costs of joint facilities on reclamation projects, because there is no open market in which the relative values of project services, such as irrigation or flood control, can be determined. Joint facilities, such as fish and wild life conservation, are not saleable items even. Of all the methods we have examined, however, perhaps the vendibility method provides for us some theoretical interest, but from practical points of view, it is not useful in the allocation of costs in river valley projects.

Before we conclude our study on the cost allocation aspect, we will also briefly see some principles to be borne in mind in the application of the above methods. Each purpose shall be assigned all direct or specific costs. The remaining cost of joining facilities should be assigned without regard to the ability of the purpose or purposes to repay the cost allocated. The allocation to each purpose should not be less than the direct cost incurred for that purpose. The cost assigned to a purpose shall not be greater than the cost of a single-purpose project intended to perform the same function.

Apart from the above principles, in matters of cost allocation with special reference to a river basin project or multi-purpose project, the following steps are to be taken in the order mentioned below:

(1) The various features of the project are tabulated according to the project plan.

(2) The project features are grouped into those performing specific purposes and those serving joint purposes.

(3) Each feature in each group is assigned the cost of that feature from the accounting records if it is completed or from the estimate of the engineer concerned if it is under construction or not yet started.

(4) The allocated costs of joint facilities are added to direct costs, to obtain the total cost of project on an allocated basis.

We are to conclude from our survey and examination of the more important methods of cost allocation that a combined use of the Alternative-Justifiable-Expenditure Method and the Priority-of-Use-Method is the most ideal for Cost Allocation in a River Valley Multi-purpose Project.

CHAPTER VI

THE PROBLEM OF REIMBURSEMENT

Reimbursement is concerned with the question: "Who pays?" and "How much?". This is always a controversial issue and particularly so in complex public undertakings such as water resource development where many different and frequently conflicting interests are generally involved. Repayment of construction costs in addition to costs of operation and maintenance is an important responsibility of the beneficiaries

of river development projects in the United States of America¹ and in most other countries of the world, including India, Australia and Pakistan. In a study regarding the benefit-cost analysis technique, or of the criteria for project priorities, the questions namely, "who will ultimately pay for the scheme?" and "how much?" are not even raised, because reimbursement is a crucial, distinct issue and it influences significantly the scope and character of river-valley developments and incidence of their costs. Decisions on reimbursement are a matter of public policy and for this no single principle could be applied dogmatically. Reimbursement policies might vary between two extremes. These are: (1) charging the users the full cost of supplying the service (2) and meeting all the costs incurred from public funds. It is even possible to utilise the reimbursement policy in a project in such a way that it might act as an instrument of taxation and help add to the savings fund of the community.

An ideal reimbursement policy, be it in a single-purpose or a multi-purpose project, should have certain objectives. In order to be fully effective, reimbursement policy must be articulated with other policies to achieve maximum development of water resources for all beneficial use. This might be taken to mean the following objectives:—

1. Reimbursability should be one of the criteria in determining whether programmes should be undertaken; but it alone should not be decisive.

2. Reimbursement policy can be used to encourage local participation in financing resources development.

3. A reimbursement policy should distinguish clearly between private and public benefits. Benefits which are primarily public or which cannot be assessed against public beneficiaries should be non-reimbursable to be covered out of public revenues.

4. The assessment and recapture of private benefits should be a main objective of reimbursement policy. Capitalisable increments, such as speculative increases in land values associated with proposed irrigation developments for which adequate reimbursement has not been required should either be prevented or recaptured by appropriate charges.

If we accept the principle that the private benefit should be considered reimbursable and public benefits non-reimbursable, we are immediately faced with another problem, namely, how to describe the two. Three approaches are available for the solution, as stated below:—

1. Collections may be made from each beneficiary, individual and local community alike, an amount corresponding roughly to the value of service. This would recapture the value accruing to individuals through a system of charges, fees and assessments. These collections having thus been secured from private beneficiaries, the residual or

¹ For an interesting account of the reimbursement practice in U.S.A., refer "Central Valley Project, Federal Reclamation Project". H. DOC. 146, 80th Congress 1st session Feb: 1947. Vide also, "Problems of Reimbursement" (MSS paper) By Dr. Karunamoy Mukerji.

un-reimbursed portion of the total investment would be treated as contribution to the general welfare to be covered from the general revenues.

2. The second approach would be to rely on benefit-cost analysis and would require each beneficiary to repay through prices, fees and assessments, the full cost of providing him the benefits. The same procedure would be applied to the determination of public revenue.

3. The third would determine the reimbursement responsibility for each function in the programme separately, the separate decisions being based on such considerations as vendibility, collectability, the ability of beneficiaries to pay, comparable practices for other functions, costs for each function, contribution to national defence and other social purposes.

According to many, a consistent reimbursement policy applicable to river basin development is desirable to minimise the windfall gains by private beneficiaries. Lands in India are now improved mainly through irrigation, and, therefore, primary beneficiaries can be charged according to their ability to pay. Such charges might cover the public costs of operating and maintaining irrigation facilities as a minimum and preferably should contribute something to the joint costs incurred in a river project.

Still another very important aspect of a proper reimbursement policy in river projects is that if the cost of a scheme is not recovered in one way or another, more purchasing power will be left in the hands of the people. This might in the long run take a turn for inflationary possibilities.

One of the main solutions for reimbursement problems that is recommended in recent years is to levy what is generally known as "Betterment Levy". The element of betterment appears in any land under the command of a project and this will enable the landowners to charge more rent for their lands. This is in a way because of the growth of the community which increases the scarcity of land. This way the owners of property will have windfall gains which are not earned by investment of their own capital or labour. It is seen that to impose levies on such surpluses is the least disturbing to production. The important point, however, is that it benefits their property, *without* reducing previous rates of profit.¹

It is generally accepted that the beneficiaries should repay at least a part of the cost invested in public projects and in this case of river projects; this might be realised through irrigation rates or cess, power revenues and from municipal, domestic and industrial water supply revenues (as is the case in the United States of America).² It would be too much to say that each benefit that is provided should be able to

¹ The problems associated with the imposition of "Betterment Levy" are discussed in a later chapter.

² *How Reclamation Pays*, U.S. Department of Interior Bureau of Reclamation 1947, gives a detailed picture of the practices in U.S.A.

repay or reimburse the allocated costs of the total investment that has gone in making it available, excepting perhaps in benefits like power and municipal, domestic and industrial water supply. Irrigation rates should cover not less than costs of operation and maintenance for public irrigation facilities and should also contribute to the joint costs within the ability of cultivators to repay. An additional consideration to be borne in mind in determining irrigation rates is that the rate should reflect the farm revenues to be expected, a judgment of the likely increase or decrease in farm costs and also the current rates in other irrigation projects, if possible.

Another very important factor that merits consideration is the period during which reimbursement should be made. Reimbursement, if it is required in the short period, would subject the beneficiaries to heavy financial difficulties because during the short period the quantum would not be such as to satisfy the principle of "ability to pay". Therefore, the choice lies between the long-run period and the moderately long period. In a country like the United States where finance is not a problem for economic development, reimbursement might be spread over a long period, say fifty years, or in some cases be even deferred. But in the case of a capital-poor country like India, it might be necessary that the reimbursement should be realised during a moderately long period, say ranging between fifteen and twenty-five years. Planning in underdeveloped countries, be it river planning or industrial planning, entails some sacrifice on the part of the people for a good economic future.

This general study of reimbursement might be wound up with some suggestions for reimbursement in general.

Primarily, multi-purpose or single-purpose programme accounts should be set up for each river basin or regional programmes through which all costs and receipts would be cleared. This should include a detailed investment balance sheet and an annual income and expenditure statement. These accounts would also be classified according to project and function. Annual costs would include operation and maintenance, reimbursement to local and state governments for any tax losses resulting from the development and also amortisation of the reimbursement investment over a period ordinarily not to exceed fifty years with or without interest as is desired by the States or countries concerned.

It would be ideal if electric energy and water supply would be sold to the public co-operative and private distribution agencies and in special instances to individual plants at not less than full costs including amortisation of all allocated portion of the total investment with interests and payments in lieu of taxes to state and local governments.

Use of inland transportation should be free until such time as co-ordinated national transportation system, with rates based uniformly on costs of services, might be established after which a system of

waterway tolls designed to reimburse the costs of providing navigation facilities should be instituted.

The operations of firms, factories, etc. situated in irrigation or reclamation districts should be specially studied and reimbursement rates fixed according to their ability to pay. It is necessary to make an overall study of the raw material supply position and market conditions in this case. Periodic adjustment too might be necessary.

The total programme costs reduced by the amounts allocated to water supply, power, navigation and reclamation, should be regarded as having been incurred for primary and secondary private benefits not susceptible to collection by direct charges and for public benefits of local, state and national dimensions.

The unallocated costs of each basin programme would be apportioned among primary benefits, not directly collectible secondary benefits, and general welfare benefits by agreement between the basin authorities and states involved. This agreement should also include the allotment between the states of responsibility for securing reimbursement for primary benefits not otherwise reimbursed and secondary benefits. Such allotments are to be based on the incidence of such benefits. Perhaps these allotments could be made in terms of percentages of annual programme costs subject to periodic review. The states should agree to arrange for repayment of such allotments. The balance should be considered as representing general welfare or non-reimbursable benefits.

The above is only an overall consideration of a system of repayment of finance investment on river projects. The various aspects of the problem in India are to be studied in the chapters that follow.

CHAPTER VII

THE IRRIGATION RATES

The investment in any public utility concern generally presupposes reimbursement. This holds good in the case of single-purpose irrigation projects, hydro-electric projects or multi-purpose river projects. One of the benefits that a multi-purpose river project renders usually is the supply of water for irrigation. It is considered necessary and would be of interest to make a detailed study of the problems of charging for water with special reference to conditions obtaining in India.

The general principle that underlines "charges for water" is that much benefit is obtained by the cultivator as a result of the supply of irrigation water, which has been possible only because of capital invested in irrigation enterprises. For deriving this extra benefit, the beneficiary is to pay a charge so that the investing authority may be able to realise the cost which was invested to make available such a benefit.

Before coming to the study of irrigation cess or water rates in India, a short review may be made of the practices of other countries

in the present century. In America, the chief feature lies in the assistance given by legislation to the establishment of irrigation companies, which are enabled to raise money by the issue of bonds for the construction of irrigation works and to collect the interest on the bonds by compulsory charges on the lands affected by such works as in the early days of this century. In Egypt, as also in some parts of India, there is no cultivation without irrigation, and there is no separate water rate as such. There the payment of land tax (land revenue) confers the right to a supply of water and imposes on the government the obligation to make that supply available. In 1920's the irrigation rate in America amounted generally from one-fifth to one-sixth of the value of the crop, in Egypt one-seventh and in India one-tenth.¹ Even in those early days, there was much to be learnt from France, Italy, Spain, etc., in regard to the subject of purchase of water by "module" and distribution of farmers by means of co-operative irrigation societies, which were responsible for the collection of water charges. All over the world, in the main, irrigation enterprises are generally possessed by either private irrigation companies or undertaken by governments. In the former case, naturally the problem of commercial proficiency arises, and in the latter the farmers' point of view prevails. In either case, it is necessary that taxes should be levied, based on the profits of farming which the water helps to create.

Diverse conditions obtaining in India have had their effect on the determination of irrigation rates here. Some of these may be listed as the conditions of rainfall, those arising out of the configuration of the country, conditions of tenure, varieties of crops grown, etc. It is natural that where such different conditions are obtained there are various opinions regarding "what should be the proper charge for water". There is the school of thought which pleads that supply of irrigation water is a service which the state must perform and that water charges should total up the actual cost price. There is another school at the other extreme which says that an irrigation work benefits only a section of the community, that the capital out of which it is constructed belongs to the general tax payer! Between these two extreme viewpoints, there are variations, most of them due to the variety of conditions obtained.

In India right from the beginning of the modern era of irrigation to the present day which covers nearly three-fourths of a century, the practice of charging for water varied from province to province and state to state. It was and is not infrequent to find water rates varying widely even within the limits of a single province.

Irrigation works were classified into two classes till very recently, though the classification is obsolete by now. The first, namely *Protective Works*, were those constructed with the full knowledge that they were not likely to pay their way, but purely as a preventive of the evils of famines. They were not expected to bring in full return on the

¹ *Report of the Indian Taxation Enquiry Committee (1924-25)*, Vol. 1, 1926, Cal—pp. 98-99.

capital cost. But indirectly they might do the above function by avoiding expenditure on such items of an apparently wasteful kind like measures of famine relief. An ancient tradition in India, and one introduced by the Indian Irrigation Commission (1901-03) links up the return on irrigation with the periodicity and toll of famines. The Irrigation Commission's now-forgotten equation which had a fair trial during the period of a rapid extension of irrigated acreage in India was as follows:-

Protective value of $\frac{F}{Pn - a}$
 an irrigated acreage = $\frac{F}{Pn - a}$, where 'F' is the cost of famine for a period of 25 years. 'P' is the population, 'n' is the irrigated area needed per head (varying between 0.3 and 0.5 acre per person) and 'a' is the actual area irrigated. It is not easy to discover why this method of assessment of protective value (or permissible capital outlay) on an irrigation project was ultimately abandoned. It goes without saying that as population increases, the value of irrigation becomes more and more pronounced, but the effect of any such increase according to the above formula will be to increase the divisor in the equation—unless indeed famine expenditure has also increased enormously or there has been a really impressive extension of irrigated acreage in the meantime. As the divisor becomes larger and larger the permissible capital outlay is automatically decreased. The formula in short ultimately defeated itself.¹

Reverting to the discussion of returns on the two-fold classification of irrigation works we come to the second one, namely, "productive" irrigation works. In brief, it may be pointed out that the productive ones are those which yield sufficient returns which make the reimbursement of capital invested a profitable proposition, i.e. meets complete reimbursement. The Indian Irrigation Commission subdivided the rates charged for productive works into two, namely, those charged on the actual cultivator and those charged on the owner of the land whether he was a cultivator or not. The rates charged on the cultivator as observed by the Indian Taxation Enquiry Committee of 1924-25 were as follows:-

(a) A consolidated wet rate charged on the settlement principle of taking a share of produce of land and water together.

(b) A consolidated wet rate charged on the same plan but subject to the additional principle that the government were entitled on the ground of their guaranteeing the supply of water to take a larger share of the produce in the case of land so guaranteed than they took in the case of ordinary dry land.

(c) A consolidated rate charged in Sind where the yield of land and water were treated together because without irrigation there could be no cultivation at all.

¹ *The Eastern Economist*, January 12, 1951, p. 52, from an article "The Return on Irrigation".

(d) A differential rate based on the excess over the dry rate to which a particular piece of land was assessed, of the corresponding wet rate in the same village.

(e) A fixed rate varying generally with the nature of irrigation work and the nature of the crop grown and charged by agreement whether the land commanded was cultivated or not.

(f) A fixed rate based on similar principles but charged only on the area actually cultivated in the year.¹

In the light of the principles enunciated above, it is interesting to note that the rates charged on the owners were not so high, but the following may be noted as indications of a tendency to add a charge on the owner for the added value given to his land to that on the occupier for the service rendered to his crop:—

(1) A fixed charge of Rs. 25 per acre in the Kistna delta in Madras for the privilege of inclusion in the guaranteed area.

(2) The owner's rate in the United Provinces charged under Section 37 of the Northern India Canal and Drainage Act, 1873.

(3) The water or canal advantage rate levied in the Punjab.

(4) The proposal to impose some levy on the proprietors in the Deccan and Bombay.

The Indian Taxation Enquiry Committee of 1924-25 in its report discusses some important aspects in the determination of water rates. To begin with, the twin considerations are: (a) the basis on which water rates should be fixed, and (b) the period for which they should be current.² As to the former the number of bases can be quite large: (i) cost, (ii) quantity of water supplied, (iii) value or net profits, (iv) prices — to point out some important ones. In the opinions of the Committee water should not be supplied at a rate which does not cover the interest on the capital cost and cost of maintenance of the work, except in the case of protective works, but subject to this proviso, the particular individual who receives water is not entitled to any special advantage because it happens to be comparatively cheap to supply it to the particular area in which his land is situated. To charge water by quantity seems ideal. But it has been found practical to impose such a charge only in the case of a few large holders of agricultural land. Combined with this is a charge by area and by the nature of the crop. Here the value or net profits will have to be duly taken into consideration. But this is possible to be carried out in a general way. To consider rent alone as a basis would not at all be suitable since that would involve basing the charge on a standard rental for a particular class of soil irrespective of the crop grown. The alternative that remains is that of prices which provides a general indication of values. The Committee

¹ Vide Report of the *Indian Taxation Enquiry Committee* (1924-25) Vol. 1, p. 102.

² For a detailed treatment of the various rates charged under both the previously-mentioned heads, reference is to the *Indian Taxation Enquiry Committee* (1924-15), Report Vol. 1, pp. 102-109.

comes to the conclusion that a combination of the area, crop and prices as a basis for the determination of water rates would be ideal.

The conclusions arrived at were, however, not different to any great extent from the then announced policies of the government of India as embodied in the policy statements of 1880, 1904 and 1922. It is considered necessary, however, to cite here the principles for general application that the Taxation Enquiry Committee (1924-25) suggested:¹

"(1) It seems to be clear especially in view of recent developments of land revenue systems that wherever possible the charge for water should be separated from the charge for the land.

(2) The minimum charge except in the case of protective works or where a special concession is given to a particular area or class of cultivators should be the cost of supplying water, that is to say, the cost of maintenance of irrigation work plus interest on capital cost.

(3) The maximum should be a figure so fixed as to take for government the whole of the increase in return from the land except such portion as will be just sufficient to induce the cultivator to take the water.

(4) The normal should be a moderate share of the value of the water to the cultivator.

(5) This value will vary with prices, with the demand for water, with the reliability of the source of supply and with the quality of water . . . once the figure of cost is covered.

(6) The rate should be fixed per acre or other unit of area and should take account of the value as so determined and of the quantity used as estimated with reference to a schedule of proportional requirements of different crops in the locality.

(7) The rates should be as few as possible and they should be examined with a view to increase or decrease periodically not less than once in ten years.

(8) Where the demand is not constant, and the ryots agree to pay for water whether they require it or not, a reduced payment for a term of years may be accepted.

(9) Where a guarantee of supply is newly given, it is legitimate to take a reasonable share of the addition made to the capital or annual value of the land by such guarantee. This should be a charge on the occupier for the use of water. In the case of a controlled rent there should be provision for recovery from the tenant.

(10) The rates under protective works should be examined periodically with the rest unless there are special reasons for subsidising the cultivators under these works at the expense of general tax-payer".

Sir Percy Thompson who was a member of the 1924-25 Taxation Enquiry Committee held the view that the Government of India held in 1922, cited elsewhere. He maintained that that policy should be positively pursued though difficulties might be met with in its actual implementation.

¹ Vide *Ibid.*, pp. 112-13.

It is to be specially pointed out that the Taxation Enquiry Committee (1924-25) omitted to treat some important principles which were in practice in the first two decades of this century. This is evident from a study of charges for water which may be found in the Triennial Review of Irrigation in India 1918-1921.¹ After dealing with some principles in practice the review states that "these methods may however be regarded as exceptional. Over greater parts of India water is paid for separately". And, again, "various methods have been tried such as renting outlets for an annual sum . . . but those have never been successful. The cultivator fully understands the principle of 'no crop no charge' which is followed now as far as possible in canal administration, but has no confidence in the system under which his liability for water rate is independent of the area and quality of his crop." The Triennial Review also mentions in detail the "long lease system" which was in force in Bengal and United Provinces under which the cultivators paid a small rate for a term of years whether they took water or not. The underlying principles is that by paying a reduced rate for a term of years they become entitled to water when required. But the contention of the review that "Irrigation is offered on extremely easy terms and that the water rates represent only a very small percent of the extra profit which the cultivator secures owing to the water he receives", was disproved in the run of years.

It is strange that the National Planning Committee which was formed under the chairmanship of Jawaharlal Nehru in 1939, did not pay adequate thought to this important aspect of irrigation though it championed, perhaps for the first time, the urgency of multi-purpose development of Indian rivers.² Coming to a later date we find that the authors of the First Five Year Plan have given some thought to this important aspect of reimbursement in irrigation enterprise.

This brings us to irrigation rates in India in the modern era—an era of planning in India. The charges for water supplied (even today) for irrigation from government canals, etc., are levied in different ways in various regions. The Planning Commission in the First Five Year Plan has made a study of this problem, though in a brief compass. It says that, in general, charges for water comprise water rate, an increment in land revenue, betterment levy and irrigation.³

We shall attempt now to give a fairly comprehensive account of the various systems of levy that are in vogue in India. The idea of betterment levy, thought of recent origin in India, is all-important and has an intimate bearing upon modern irrigation policy of the Government, and it will receive separate treatment in a subsequent chapter.

Before we enter into a discussion of the various rates for water (irrigation), it may be pointed out that the existing rates have developed difficulty in different states with the result that there is multiplicity

¹ *Vide Triennial Review of Irrigation, 1918-1921*, pp. 12-13.

² *National Planning Committee's report on River Training and Irrigation*.

³ *First Five Year Plan*, pp. 357-359

both in principles and the rates of assessment. According to the Taxation Enquiry Commission (1953-54) under the chairmanship of Dr. John Mathai, the current water charges can be broadly classified under the following heads:-

"(1) Those payable by cultivators in return for the service of irrigation and thus forming an item in the cost of production; and

(2) those payable by the owners of lands benefited, in consideration of the increase in the value of the land".¹

The more important systems of levying water charges may be grouped as Volumetric rate, Consolidated rate, Differential rate, Occupier's rate, and Agreement rate. Let us discuss each of the above.

Volumetric rate is the charge levied according to the quantity of water actually delivered. This principle was considered both by the Taxation Enquiry Committee, 1924-25, and the Taxation Enquiry Commission, 1953-54. The principle is identical with that of the units of consumption. This system may lead to the economical use of water. The main difficulty arises when the question of measurement of water supplied arises. The proper and effective management of water distribution is the sheet-anchor for the success of this method, which, as experience has proved, is almost impossible to attain.

Another system of charging for water is the Consolidated rate, where water charge is consolidated with the land revenue assessment and is fixed on the settlement principle. The salient feature of this system is that it does away with a number of taxes and thus facilitates and economises the process of collection of taxes. This also ensures a sure minimum of reimbursement, because by the application of the system payment of water charges becomes more or less compulsory. It is found, however, that this method has gained the disfavour of taxation machinery and is not applied at all in the new projects. The examination of this system has significance only as far as some old projects are concerned.

Yet, another system of water charges that is in vogue in parts of Andhra and Madras in some older works is the "Differential rate". This has been brushed aside as "unsound in theory and clumsy in practice" by the Taxation Enquiry Commission (1953-54). Differential rate is a rate for water taken on dry land from government sources of irrigation corresponding to the difference between the assessment on dry lands and wet lands".² The merits of this system are said to be that it enables a charge in proportion with the yield of the land and that it does away with the inadequacies and defects of a method of fixed water-rates, but it can be applied only in those areas where a proper and thorough land classification has been made. But the system involves a large amount of complicated calculations which are neither

¹ Government of India Taxation Enquiry Commission (1953-54), Report Volume III, p. 245.

² Taxation Enquiry Commission, *loc. cit.*

understandable by the cultivators nor the rank and file officers. The merits regarding the practicability of this method can rightly be doubted.

A system that is in general use in India is the "Occupier's rate" which is a sort of fixed rate charged on the area actually irrigated and which usually varies with the nature of crop or crops, the quantity of water normally required by the crop, the scarcity or abundance of water at the time of supply, and the value of the crop. Under this system, the economy in the use of water may not at times be achieved. There is truth in the contention of the Taxation Enquiry Commission that "under conditions of competitive demand, it fails to secure optimum revenue to the government."

Still another system that is in practice is the "Agreement rate" under which rates are fixed by agreement for a period of years and paid for positively whether water is taken or not. This is necessitated by local conditions in certain areas like the Madhya Pradesh, West Bengal, Orissa, etc., It may be that in a certain year the cultivator will demand water and that in certain other he may not. From the financial point of view it has been found necessary to give long-term block-leases which very often extend for a period of ten years. Under this system, payment of water rates is compulsory so that "Government is not saddled with the cost of maintenance of works without realising water charges". It is natural that under the long-term agreements the cultivator will be asked to pay a relatively lower charge. In the Deccan, Godavari and Krishna Districts of South India we find these rates in operation.

During the pre-War II days the significance of irrigation rates as a source of revenue was indeed paramount. With the excessive cost in the price of foods and construction materials during the war and post-war years, the cost of construction of new irrigation works as well as the maintenance of the old ones registered a phenomenal increase. "The significance of irrigation as an item in states' budget has, therefore, dwindled relatively to the growth of other resources and at present it constitutes hardly three percent of the combined revenues of Part A and Part B States".¹ Several State governments have taken steps to increase the reimbursement rate on irrigation water either through additional charges or increase of existing rates. The incidence of the water-rates which were fixed during the pre-war days has gone down considerably in recent years making the case for revision of rates all too clear. Of the various methods contemplated to improve the return on capital outlay, the one which is given specific consideration by the authors of the First Five Year Plan is the betterment levy. The advisability of imposing betterment levy which is fairly recent in origin, is being debated still both from the theoretical and practical points of view.²

¹ Vide Table-2 below in this Chapter, and *ibid*, p. 249.

² This question will receive elaborate treatment in the next Chapter.

It is evident from the earlier part of this discussion that the Indian Irrigation Commission of 1901-03, the Triennial Review of Irrigation 1918-21, and the Taxation Enquiry Committee of 1924-25, all have considered the question of fixing irrigation rates in the context of irrigation works classified as "productive" and "unproductive". Of late this classification has become rather obsolete and this "conventional distinction" has since been given up with the relaxation of financial tests. The tendency these days as far as the feasibility of investments in irrigation enterprises is concerned is to examine items more from the viewpoint of "the totality of welfare the schemes help to create, than from that of the prospect of immediate cash returns". The Taxation Enquiry Commission, 1953-54, however, recommends as a general principle that future systems of water charges would be such as to promote economy in the use of canal water and create conditions which will make the maintenance and development of irrigation schemes possible on a larger scale.

The water rates today combine two aspects, namely, tax and payment for service. In a way it can be said that as water rates mainly depend on the economic and other circumstances of the area commanded by the works, in some cases it takes the character of a tax and in some others it assumes that of a service charge. It should be observed that broadly the taxes may be assessed according to the principles of (a) no loss and no profit, (b) no profit and some loss (c) some profit and no loss. It appeals to commonsense when it is said that a policy in this sphere should follow the "no profit, no loss" principle, as the State should be a non-profit-making concern. But the principle of "some profit and no loss" could conveniently be followed in cases where the cultivator's ability to pay is sufficient enough and provided that the revenue thus realised be ploughed back into further developmental purposes in the places of actual realisation. (If the last-mentioned condition is not satisfied the people from whom such taxes are levied would be subject to discriminatory treatment which is least desirable!) It is the opinion of the Taxation Enquiry Commission that as a general principle the realisation of water charges should cover the maintenance charges. The schemes other than those in scarcity areas should not involve loss to the general revenue. It is found specially in recent years that there is much variation in the demand for irrigation water. In such a situation the collection of revenue just enough for the maintenance of canals, etc., would be an act of economic risk on the part of government. This upholds the advisability of a compulsory or fixed rate of charge. If, however, the rates are so high as to cover maintenance costs, debt charges and other overhead costs, etc., the burden that will be shifted on to the shoulders of the cultivators would be too much. It again appeals to reason when it is argued that water rates should cover at least the maintenance costs. The Commission further opines that the rates which are voluntarily payable on the supply of irrigation water should be so computed as to cover the overhead costs and debt charges of an irrigation project. While this serves as the main principle, other considerations such as, ability to pay on the part of

users, the quantity of water used, the value of crops raised from the irrigated tract, etc. should also be kept in view.

From our discussion so far it is evident that in the determination of rates no single factor can serve as the determining criterion. Another important point is that in the case of fixed rates for a long term, there should certainly be provision for making revisions. This may be necessitated by changes in the price level. Apart from this there should be provision for review of rates at not too distant intervals. There is a particular opinion which pleads for the equalisation and standardisation of irrigation rates all through the nation. Though there remains vast scope for minimising the big gaps or discrepancies that do exist at present, it would not be within the bounds of possibility to bring about a single rate all over the irrigated lands throughout the country. It may be necessary at the initial stages of irrigation development to offer what are generally called "concessional or incentive rates". This is to apply not to the compulsory charges. But the concessional rates or incentive rates are not to continue indefinitely. Normal charges should be realised as soon as the cultivators start realising benefits. As far as the realisation process is concerned, it is advisable to shift the responsibility in the case of very small undertakings like tanks, etc., to self-governing village *Panchayat* authorities; in the case of bigger enterprises it is a "must" that the State should directly be responsible.

After having surveyed so far the progress of thought on the principles of water rates or irrigation charges, let us now pass on to their actual working in India. It is not necessary to examine in detail the various systems and rates prevalent in various states.¹ It has been stressed that it is difficult to effect uniformity of rates and in the system of collection; but the point which deserves consideration is the unsatisfactory state of yield of these imposts in relation to capital outlays specially in the context of heavy increase in the irrigation expenditure of the State governments on account of the sharp rise, as noted earlier, that has taken place in the price of materials and in wages and salaries, the cost of construction of new irrigation works and the maintenance of old and new ones.² An analysis of the financial results of certain works taken at random has shown that the average running expenditure on irrigation systems has varied between 55% and 77% of gross receipts during 1948-49 to 1950-51 as compared to 40% during 1938-39. As is well known, further expenditure was necessitated under the Grow More Food Campaign by the accumulation of interest charges and the large-scale extension and renovation of small schemes. Given below are statistics which show the working expenditure on all irrigation projects, and total receipts and expenditure on irrigation account.

¹ For a study of the systems of water charges and the present schedules of water rates in certain States, vide Taxation Enquiry Commission's Report, Vol. III, pp. 315-16.

² Vide *The Eastern Economist* Special Budget Number, March 5, 1955, pp. 379-80.

TABLE 1
Working Expenditure on all Irrigation Projects.
 (In Lakhs of Rupees)¹

Year	Gross receipts	Working expenses	Net Revenue	Proportion of working expenses to gross revenue.
1938-39	450.26	177.32	272.94	39.38
1948-49	539.86	415.42	124.44	76.95
1949-50	744.65	403.43	341.22	54.17
1950-51	795.38	507.00	287.39	68.36

TABLE 2
Total Receipts and Expenditure on Irrigation Account. (Part A and B States)¹

Year	Receipts from major works	Total receipts	% to total revenue	Interest & other charges	% to total expenditure on revenue a/c	Receipts from minor works
1951-52	599.86	780.96	1.95	1658.35	4.31	181.10
1952-53	658.56	873.92	2.29	1688.70	3.88	215.36
1953-54	776.17	1062.51	2.47	1866.70	3.96	286.34
1954-55	937.30	1267.47	2.62	2097.93	3.98	330.17

From the above two tables, it is clear that the states have a good case for stepping up the degree of their "irrigation imposts" particularly water rates, and betterment levies. At present the water rates are fixed with reference to maintenance costs. It has been noted earlier that this system has got its own defects. Be it repeated here that where the water from irrigation projects is taken only to supplement the rainfall, governments are put to much loss and naturally fail to recover even the minimum cost of keeping the irrigation systems in working condition. It is high time that the States concerned took positive measures to upgrade the irrigation rates.² The only two points that the

¹ *Loc. cit.*

² One of the recommendations of the Mehta Foodgrains Committee 1957 is that irrigation rates should be lowered so as to encourage the more extensive utilisation of canal waters by farmers in the interest of higher food production. One may hope, however, that the inflation of food prices, as in 1957, would be effectively combated so that it would disappear very soon.

Government will have to be particular about are that it should be able to (1) supply proper irrigation facilities in time, and (2) convince people that the benefits they stand to gain are immense compared with the relatively fair upgrading of rates. There are reasons to think that the government have so far failed to achieve this twofold difficult task. The problem, then, resolves itself into the need of formulating a definite policy regarding the determination of irrigation rates which would solve the difficult problem of reimbursement and, at the same time, find wide and ready acceptance by the people and which would provide sufficient incentive for increased food production, which latter is the end and aim of special bias given to irrigation in the First and Second Five Year Plans, more so in the First Five Year Plan. Let us try to examine this aspect (need of increased irrigation) from a wider angle.

The quantity of water harnessed will raise irrigation utilisation from 76 million acre feet¹ to almost 145 million acre feet at the end of the Second Five Year Plan, an increase of nearly 100 per cent. The corresponding increase in irrigated area is estimated at 37.3 million acres raising the total irrigated area to 88.8 million acres representing a 73% increase as compared with the area at the beginning of the First Plan.

The marked increases in the volume of irrigated water and irrigated area have created many problems, too. As was already pointed out, one of the main problems is the supply of irrigation water and the manner in which it has to be paid for by the cultivator. If valuable irrigation water is allowed to be wasted and there is no penalty for such waste, the community as a whole loses without anyone receiving the benefits which would accrue through its more efficient and economic use. This can be ensured if water could also be sold like gas or electricity, on the basis of quantity supplied rather than on the area of matured crops which is, at present, the basis of the charge on the cultivator in most states. This procedure was considered to be fraught with difficulties in the 1930's but it calls for a review today.

As an example, let us consider electric power which is supplied for a maximum connected load. The users are charged on the basis of the quantity actually used and measured on the energy meters. They are free to use it for all or part of the time. If someone does not use, the energy is free for others to use. Thus the resource is put to maximum use with the limitation only of the capacity of the generating system. In this manner, not only is the income greater to the supplier but the industrial output for the power is also maximum. As against this if the users were to get power-supply on a fixed maximum charge based on some average computed quantity of utilisation, the incentive for conserving resources or avoiding waste would be absent, because the consumers would not in any case be liable to pay more than the fixed charge. This analogy in fact applies to a large extent if we consider an

¹ One acre-foot is the amount of water that would cover one acre to a depth of one foot.

area of established irrigation in which the experience of any year has eliminated the unknown factors of "how-much-water?" and "at what time?" Thereafter only the question of volumetric measurement would remain. This is no longer an unsolved problem because water meters of small cost and simple mechanism have been in vogue in Italy, Australia and America for years together. In the Punjab, too, volumetric measurement of tariffs in some of the outlets on the lower Chenab and Lower Bari Doab canals were practised although on a limited scale. Such irrigation water-meters can be made in India and would be welcome to the user because he will know what he has to pay. Volumetric assessment has worked out successfully in case of bulk-purchasers like municipalities, large estates or factories. This is known as supply on contract. It is generally based on a volumetric calculation for a full cropping season. But it has the advantage of user being free to apply the water to as much area as he likes. He can thereby exercise full initiative in the planning and management of his agriculture. He is also free from the interference or exactions of subordinate officials. Even with the abolition of hereditary large estates (*Jagirs* or *Taluks* or *Zamindaries*) several villages will come into the categories of co-operative holdings (for example, the recent "Gramdan" movement). These would be a good case for joint management of irrigation water. To such villages water can be sold on the volumetric contract basis.

The above method of volumetric distribution is based on the possibility of guaranteed supply to users. In the weir-controlled run-off, the river canal system where no storage of water can be obtained in the river basins, such a guarantee cannot be given because of seasonal fluctuations in the river flows. Here canals have to be closed in the case of floods. These have also to be run with short supplies only in case of the low flow period of the river. In case of storage reservoirs, there is ample reserve in the artificial lakes above the dams. Against any abnormal situation of floods or low supplies, the reservoir can even off fluctuation. Irrigation authorities are in a position to guarantee supplies according to a fixed time-table. There may be some infrequent emergencies when the canals have to be closed for extraordinary floods, repairs, inspections, etc., but these are few and far between.

The crucial question is how to arrive at an appropriate water rate to be charged on volumetric basis. Here perhaps the same practices as in the sale of electric power might be followed. The rate should be as low as possible to enable the highest sales. So, what appears to be a loss in the rate would be more than made up by the volume of sales.

In the present context of our economy, yet another yardstick for computing such a rate may well be the present pattern of charges made for irrigation water on an acreage basis for various crops. This was mentioned earlier in this chapter. An important distinction (and improvement) that is called for in the case of guaranteed supplies from storage reservoirs is the determination of optimum crop pattern which will come into vogue with the introduction of round-the-year supplies.

Thus double cropping and better yields may be taken for granted on the known characteristics of the soil and existing crop patterns in a project region. Such determination can be made periodically (say, once in ten years) and the optimum water rates fixed on the basis of what the cultivator can be expected to pay on the existing tariffs for water rates for various crops.

The switching over from the acreage to the volumetric basis need not be sudden. One estimate of the new rate tariff is that for the cultivators it will be about 10% cheaper as compared with normal assessment on an acreage basis.¹ But the gain in terms of more volume sold will more than offset the loss on rates.

In conclusion, it may be added that the entire policy of charging irrigation rates needs to be thoroughly re-examined and completely revised if only because there is the immediate need to strike a balance between the revenue needs of the government and equitable water rates for farmers, between the upgrading of irrigation rates and the ultimate goal of increased food production at reduced average cost per unit.

CHAPTER VIII

THE BETTERMENT LEVY

The meaning of "betterment", as far as agricultural lands are concerned, is obvious. It will, however, be our endeavour in this chapter to deal at some length with the concept of betterment as related to lands commanded by the river projects, the reimbursement of the outlay expended in providing such betterment and to discuss the yardstick employed in the procurement of the levy with special emphasis to Indian conditions.

What is the measure of "betterment" of the lands falling under the jurisdiction of a river project?² From an examination of the major accomplishments from the reclamation programmes of the United States, the following general patterns of betterment were observed: (1) A large number of irrigated farms came into being. (2) Homes and means of livelihood for persons on farms within reclamation project areas were provided for. (3) Business in towns and cities dependent on reclamation project areas were stabilised. (4) For the support of public schools, banks, etc., in the areas were contributed. (5) The agricultural condition and production on project farms were stabilised. (6) There was a large increase in the value of lands. (7) As a result of various factors, markets in the areas expanded and new roads and railroads came into existence, revolutionising transport. (8) Reclamation programme proved a pioneer in the public development of hydro-

¹ This is a very liberal estimate. For an interesting controversy on this point, refer *The Statesman*, Sept. 26, 1957.

² This observational study and the like could be found in the *Report of the Special Repayment Commission, 1938, of the USA.*

electric power. (9) Security from floods was an added benefit. (10) A new life and a new people flowered in the reclaimed areas. Perhaps, there "is no way of measuring accurately the full contributions these enterprises have made to business and social life of the states and communities in which they are located and to the national wealth. Once a river project swings into operation a series of chain reactions set in and the resultant multiplier effect is felt."¹ "Land reclamation is no longer judged from the simple point of view of economic profit of favourable balance of expenditure, but on the basis of the whole of the advantages derived from it, which go far beyond the narrow idea of return to the private operator. The consideration is the increase in the aggregate return accruing to the farming and also the non-farming classes, throughout the country, from the fact of the increase in production, from the larger possibilities of employment and from the impulse given to internal land settlement".² In modern times, investments in river projects have taken a new trend. The problem that the modern governments strive to solve in the river valleys is that of estimating the results of the impact of a set of initial investments on other parts of the economy through their direct and indirect secondary effects. These may tend to the betterment of the lands either by balancing the economy of a region or by the industrialisation of backward areas through a series of multiplier effects.³

While projects take shape both in the short and long run we find the effects of investment take two distinct shapes, namely, increased production on the one side and on the other an increased valuation of land. The increase in the value of land may be identified as an unearned increment. However, the problem that arises in this connection is to strike a scientific distinction between the short-term and the long-term process of development that will be set in motion. It is rather difficult to measure the extent of betterment that a land under a reclamation programme would attain because there exist actual and potential results as between short-term and long-term periods. As years roll on, the results of the multiplier effect would cumulate resulting in a constantly improving condition of land. In brief, it may be said that the element of betterment as far as reclamation programmes are concerned can be said to consist in the utilisation of idle resources available for exploitation of the opportunities opened by capital works. The consideration of the possibility of employing idle resources is of great importance in the multiplier approach, in irrigation programmes and reclamation projects as there is no finality about development as such in irrigated areas, for economic development is a continuing process.

It is necessary to elucidate some of the ideas considered above. What are the various opportunities to which the multiplier effect in a

¹ Report of *An Economic Survey of Certain Federal and Private Irrigation Projects*, 1929, published by the US Bureau of Reclamation, U.S.A., p. 2.

² G. Constanzo: "Land Reclamation and Improvement in Europe" in *Monthly Bulletin of Agriculture and Sociology*, Rome, 1938, No. 10, p. 454. L.

³ *Economic Effects of Irrigation*, D. R. Gadgil, p. 9.

river valley project gives rise, and how? The various economic opportunities that would be provided were treated in an earlier chapter. But one important point remains to be considered. In the case of a river project, the effect or betterment is created not only by separate aspects like irrigation benefits, security from floods, supply of hydro-electricity for the development of small and medium-scale industries, etc. It should be remembered that flood control, provision of hydro-electricity, irrigation water supply, etc., are intimately connected with agricultural lands and all these combine to bring about a regeneration in or betterment of agricultural lands. Though this wider aspect of betterment was and is widely being recognised for purposes of Acts and Bills, in India the competent authorities concerned confine themselves to the idea of betterment arising from particular works of improvement, namely, the construction, extension or improvement of irrigation and drainage works. (It may be noted that in India, generally irrigation "works" as defined in Acts and Bills include all canals, channels, tanks, reservoirs, etc., used for the supply or storage of water and all works, embankments, structures etc., owned or controlled by the state. Drainage works denote all works for the protection of land from floods, including escape channels.)

Having dealt with the concept of betterment, we pass on to the question of levy on the betterment of agricultural lands, which is the main topic of discussion in this chapter. The principle that when property has increased in value due to any work of improvement carried out by the state or public authority, the state or the authority is entitled to have a share of such enhanced value, has been accepted in many countries.¹

It would be erroneous to suggest that the principle is absolutely new to India. In the 19th century when the British manned many of the irrigation canals in India they realised both direct and indirect revenues.² A betterment tax on lands brought under irrigation was in vogue in Mysore since 1888. Under the Irwin Canal system the landowner was to pay a tax of Rs. 150/- per acre. It is expressly desired in the First Five Year Plan (to come to modern times) that betterment levy should be imposed. The idea of betterment levy shot into prominence since the Planning Commission recommended to the State Governments the promotion of legislation for the imposition of betterment levy.³ Bombay, Hyderabad, Punjab, PEPSU and such other states have already enacted the necessary legislation.

It is pertinent to mention here that the theory and assessment of betterment were developed in countries like the U.S.A., U.K., etc., with a relatively quick urbanisation and speedy implementation of town planning. Under the special assessments in the United States, this prin-

¹ A fairly good account may be gathered from *Encyclopaedia Americana*.

² *The Irrigation Works of India and their Financial Results* by Robert Buckley, p. 173

³ Irrigation charges, betterment levy, etc., come under the jurisdiction of States and not the Centre.

ciple has been defined as follows: "persons benefited by public expenditure should contribute to such expenditure to the extent of the increased value of their property and this not only if the improvement effected by the public authority was carried out for the purpose of conferring a benefit on such property but also if the resulting benefit was purely accidental, the expenditure having been undertaken for a totally different purpose". As far as the United Kingdom is concerned, the application of this principle was limited to certain particular improvements carried out by public expenditure. From the Uthwatt Committee Report, it is clear that of late this type of levy is extended to cases where property has increased in value "by the operation of any provision contained in any scheme of Town Planning, irrespective of the question of financial investment or otherwise." Even an increase of value arising out of the growth of urban population is stipulated to fall under the term "betterment" which is subject to the levy. In 1942, an effort was made in Britain to examine the theory and practice of betterment in that country. According to the Committee referred to above¹ "the term 'betterment' may now be taken in its technical sense to mean any increase in the value of land (including buildings thereon) arising from central or local government action whether positive or negative" (Positive, e.g. execution of public works; Negative, e.g., imposition of restrictions on land). As was stated earlier, in India the term "betterment" was and is being used with a slightly different emphasis. According to the Reclamation Act of 1902 in the U.S.A. construction charges on the federal projects were recoverable from settlers in ten annual instalments. A Fact Finder Committee appointed in 1924 had something new to say by recommending a system of differential payments related to productive earnings from lands.²

The benefits that a multi-purpose river project renders and the investment in it can be viewed, it may be repeated here, from the angle of joint supply and joint cost. According to T. W. Taussig, the element of joint cost arises when a large plant is used for diverse purposes.³ When two or more commodities are produced with the same joint cost in such a way that the production of one would automatically involve the production of one more or many more, they are said to have a joint supply. A multi-purpose river valley project is exactly of such nature, which involves joint cost and joint supply. In the cases of joint products, theoretically though it is possible to calculate the marginal cost of various services rendered, in the case of multi-purpose river valley projects it is futile to attempt at the accurate computation of

¹ The Uthwatt Committee was appointed for that purpose in 1942 which submitted a Report in the same year.

² The Reclamation Act of 1902, the Fact Finders' Committee Reports, 1924 and the article "Repayment Experience in the Federal Reclamation Projects" in the *Journal of Farm Economics*, 1945, p. 159 by Alexander Joss, would give a fairly good idea of repayment for betterment in the U.S.A.

³ T. W. Taussig: *Principles of Economics*, Vol II, p. 423. We find an interesting discussion on joint cost in connection with his famous arguments with Prof. A.C. Pigou over the determination of railway rates.

marginal cost of, for example, flood control benefit or irrigation water. This presents a big problem of cost allocation as discussed in a previous chapter.

Besides this joint cost, there remains the problem of *direct costs* and *associated costs*; and these are distinct from each other. The investment in developmental activities in this field does not stop with supply of irrigation water or bringing electricity to the countryside. This presupposes an associated cost for the extension of irrigation water to the particular fields or the extension of electricity from main lines to the households or mills or factories. In case these costs are borne by the beneficiaries, incidence of taxation that falls on their shoulders would tend to be too much of a burden and would not be justified, if the basis of the levy is to be the principles of marginal utility and marginal cost of supply. There is a tendency, especially in India, to be unmindful of this important aspect of *associated costs*. Would it be justified if one says that it is the beneficiary who derives the services and, therefore, he should bear a considerable part or whole of the associated costs? No. In such a case the problem of consumption of the services rendered would become another problem to the project authorities. This assumes additional gravity in underdeveloped countries where the *per capita* income is low, with rising cost of living, with mounting indebtedness, little or no savings, and inadequate technical-mindedness. It is right to say that in such countries where a wide disparity exists in the economic framework of society — be it in the matter of possession of land, or other economic opportunities — the idea of betterment would not be workable, without injuring a section of society — the marginal landowners, for example. The practice of providing a uniform yardstick for the imposition of betterment levy seems to be rather absurd in this context. In services which are of a socialised nature, it must be the duty of the state to bear the entire expenditure as a whole. It is justifiable to say that by way of tax only the unearned increment arising as a result of economic development should be charged. But here again arises the problem of finding a yardstick for the determination of the value of economic development in monetary terms and the more difficult problem of measuring unearned increment.

From the preceding discussion, it appears then that the principles that the tariff should be fixed on the basis of the marginal cost and marginal utility of the service rendered, that the particular class of people who are benefited by particular kind of service should bear the cost, are not easily realisable in the case of a multi-purpose river project.

The concept of betterment levy helps, however, to check an important evil, namely, the enormous speculation in land values. Even before the project actually takes shape, there begins speculation of land and this may to a great extent be checked by the imposition of a betterment levy on lands which are sold once the plan for bringing a certain area under the operation of a project has been finalised. When the value of land shoots up in the areas to be brought under the control

of the project as a result of the gambling activities of greedy and rich speculators, the general tendency is for the land to pass on to rich absentee landlords, as it is not within the reach of small farmers and landless people to compete with mighty speculators. Though the best remedy to combat this evil seems to be statutory regulation of land prices, the enactment of laws for betterment levy by themselves will have the effect of discouraging speculation. In special cases, where other steps are needed, the State should announce them every time before individual projects are sanctioned.

It was stated earlier that a number of legislative enactments authorising betterment levy has been passed by State legislatures in India. There is, however, no uniformity in the scales and methods of the levy among the different states. In Assam the Embankment and Drainage Act was passed in 1953 to recover the initial cost of schemes either in full or in part and for their maintenance. In Bombay the Irrigation Act, 1879, was amended in 1950 to provide for the levy of betterment charge and irrigation cess; the former was meant to appropriate part of the increment in the value of lands and the latter primarily to meet the working expenses of the canal. In 1952, in the Punjab a President's Act known as the Punjab Betterment Charges and Acreage Act was enacted; the provisions of this Act were subsequently amended by the elected Assembly. The Act provides, in the main, for the recovery of betterment charges and acreage rates¹ on lands in any irrigation scheme which has come into operation after the 15th August, 1947. In PEPSU a similar Act was passed in 1953 and approved by the President in January, 1954. Under the Irrigation, Betterment Contribution and Inclusion Fees Act of 1952, the Hyderabad Government can recover either a betterment contribution or an inclusion fee on all lands benefited by any irrigation or drainage work completed since the 1st January, 1943. In Madras, an Irrigation Bill for Betterment contribution was introduced in the Legislature in 1952 and passed since. This provides for levy of betterment contribution on lands benefited by any irrigation or reclamation work constructed since January, 1943. A Bill known as the Lands Special Irrigation Charges Bill was enacted recently in Rajasthan, which seeks to levy betterment fees and acreage rates as well as water cess in respect of all lands included in irrigation schemes. In Mysore and Travancore-Cochin suitable Irrigation Amendment Acts were passed for the realisation of betterment levy. This move on the part of states to enact legislative measures for the realisation was as the result of the recommendation of the Planning Commission.² On the whole we find that the objectives of the levy are threefold as far as Indian States are concerned: first, to tax the unearned increment in the value of land; second, to meet the initial costs of various river project schemes, and third, to meet capital charges for maintenance, etc.

¹ The acreage rates are intended to cover the expenditure incurred by the government in undertaking sub-division of lands into one acre fields or in undertaking level topographical or oil surveys, etc.

² *First Five Year Plan*, p. 359, para 66.

But, what will be the basis and pitch of assessment? In the U.S.A. special assessments are charged on *pro rata* cost or *pro rata* benefit basis. Cost may also serve as another upper limit to the amount of betterment levy that may be imburshed by the State. According to the First Five Year Plan, "strictly speaking the betterment fee should not be on the profits or increased profits from the land irrigated by a project. It may have some relation to the cost of the project but should mainly be based on the increase in the value of land as a result of the facilities provided by the project."¹ The Planning Commission is aware that the betterment levy cannot be uniform in all cases; all the factors that contributed to the increase in values must, according to the Commission, be taken into consideration. According to the accepted meaning of the term "betterment", when we charge a betterment levy, it is the increase in value that is mainly the basis of such a levy. If we scrutinise some of the state laws, we find that the sole criterion in the assessment of betterment levy is the increase in the value of land. Under the Bombay Irrigation Act as amended in 1950, the basis of levy is to be the increase in the value of land by the completion or the construction of a new canal, or improvement and extension of an existing canal. The Madras Bill takes as the basis for levy the increase in "Capital Value" of the various classes of land. Apart from Madras and Bombay which take into consideration only the criterion of increase in land values, the other states like PEPSU, Rajputana, Mysore, the Punjab, etc., which have legislated measures for the betterment levy, take the following aspects into consideration: (1) the type of irrigation provided, (2) the improvement in irrigation, and (3) betterment accruing to the lands.² The common feature that we find in the various states laws is that all of them lay down that the amount of levy realised should not exceed one half of the increase in the value of lands. Though the considerations³ justifying the assessment of a levy differ from State to State, the pitch of assessment is, in fact, determined in terms of such an increase.

In the determination of betterment levy, three main aspects are to be considered: (1) Fixation of the base value from which the increase in value may be calculated, (2) Determination of the increase in value, and (3) Determination of the percentage of betterment value that the government should realise from the beneficiary. Generally, the base value should relate to the value of land prior to the commencement of the work of improvement. As was already remarked, if the proposals for a project are known earlier—long before the commencement of the actual project,—the price of the lands under its operation will materially shoot up. It would be quite possible, at least in some cases, that

¹ *Ibid*, p. 358, para 63.

² The considerations can be broadly stated as nature of the soil, productivity and fitness of irrigation, wet crops that can be economically grown, proximity to market, the expenditure incurred in the conversion of dry land into wet land.

³ *Taxation Enquiry Commission Report*, (1953-54), Vol. I. p. 257, para 29.

the full increment may be realised by the owners of such lands through sale. It is in view of this fact that legislatures of the States of Bombay, the Punjab and PEPSU have empowered their respective governments to fix the dates with reference to which land values prior to the commencement of the work and after its completion have to be ascertained or estimated for determining the extent of betterment.

It is elementary knowledge that an ideal tax system should satisfy the principles of efficiency and equity. From this point of view, the question of betterment can be discussed at length. It is obvious that a forecast about the future value of a land would only be an approximation and need not always reflect accuracy, for land values and betterment in future depends on a number of things. Even approximations can be made only on a number of assumptions. And because betterment in land is the cumulative effects of a number of active economic factors, it is not an easy task indeed if one tries to isolate other factors and prove that a part or whole of betterment is due to a particular improvement or service. "It is necessary that the mode of estimating betterment be such that the scope for the subjective influences of the assessing authority is reduced to the minimum."

As regards the actual practice followed, the Punjab rules provide that the value of lands shall be collected at 30 times the net assets¹ as defined in the Land Revenue Act 1887. It is on the basis of the owner's share being limited to one-third of the divisible produce that the net assets will be calculated. In framing the rules in the Punjab regarding betterment levy, it was recognised that the valuation of the price of land at fixed rate was not a matter amenable to exact computation. That is why it was proposed that increase in land values should be computed on the basis of "net assets". What are the factors to be taken into consideration in determining the net assets? Let us take the Expenditure-Income approach. Generally, the items for which the landowner will have to spend money or pay in kind are water rates, maintenance of means of irrigation, maintenance of embankments, supply of seeds, supply of manure, improved implements for husbandry, concessions with regard to fodder, special abatements made for fallows or bad harvests, cost of collection of rent, wages or customary dues paid to artisans or menials whose products or labour are utilised for the purposes of cultivation and harvesting, etc. To this should be added the same that would be retainable by a tenant if the land were let to a non-occupancy tenant paying rent whether in cash or in kind at the normal rate actually prevalent in the estate or group of estates. This is to be deducted from the estimated income from the land which gives us "net assets". In the Punjab, the practice in arriving at the actual valuation of land is to multiply the figure of net assets by 30. This is an arbitrary practice and why this multiplication by 30 is prescribed is not clear. This system of valuation of land has its own

¹ Net assets of an estate or group of estates means the estimated average annual surplus produce of such estate or group of estates remaining after deduction of ordinary expenses of cultivation as ascertained or estimated.

defects. What will happen, for example, if a change in tenancy legislation in the area where a new river project is completed, takes place? It may lead to the decline of land values. In such a case, betterment charges which are based on increase in land values may prejudicially affect the financial soundness of a project or affect the expected contribution to the treasury by way of reimbursement. It appears that in all states except Madras, they stipulate that the increase in the capital value of land is equal to ten times annual increase in gross value. A half of the sum by which the increase in capital value exceeds the cost of making land fit for advantageous irrigation, will be the contribution payable by such types of land. Accordingly, lands will be divided into suitable classes on the basis of estimated increase in gross produce. Estimates are made with reference to average prices prevailing during three years immediately preceding the commencement of work. In Andhra State the increase in capital value is assessed at 25 times the additional net income obtained after making proper allowance for cost of preparation of land for advantageous irrigation. The land will be divided into various classes according to soil, physical configuration and extent of reclamation required and amount of net additional income determined with reference to prices prevailing on the date of completion of work. In PEPSU in the determination of the levy, the type of irrigation, improvement in irrigation and extent of betterment accruing to the lands are considered; the procedure in Rajasthan is identical. It is perhaps the Hyderabad State (of pre-reorganisation of States period) that has legislated for innumerable considerations in determining the Levy. The Hyderabad Irrigation Act of 1952 stipulates that the assessment shall be done by a Committee with official and non-official members who are to advise collectors in the matter. The following aspects are to be considered according to the Act: (1) the market rate of dry and wet lands in the area, (2) the nature of soil productivity and fitness for irrigation, (3) whether wet crops can be grown economically, (4) proximity to markets, (5) the likely expenditure that may be incurred in converting the dry land to wet. In the case of Bombay, the assessment of value is done by the Revenue Department. The settlement officer estimates the increased value after an enquiry into the sale transactions and rentals. From the above study of the betterment levy in a few States we find that the Bombay Irrigation Act and the Madras Bill are more definite in the determination of the actual amount of the levy and do not leave scope for the play of subjective elements in its assessments. It is also seen that there are no two identical methods for the purpose.

When for once the actual betterment or the enhancement in the value of land is ascertained or estimated, the quantum of levy could be determined with definiteness. Here we have to discuss what should be the quantum of levy. It will not make much of a digression if we begin the study of this question by citing the experience of the United Kingdom in the early thirties of this century. The Town and Country Planning Bill introduced there in 1931, which became an Act in 1932, pro-

vided for the appropriation of the entire betterment value. It was very strongly criticised on the ground that a cent percent betterment charge would take away all incentives or inducements to develop the lands on the part of their owners. Thereupon the charge was reduced to 75%. Supporters of such a high levy may point out that such charges need not necessarily affect the incentive for land development adversely, for, after all, the betterment is the result of public expenditure. But then the question remains: What is the object of public expenditure and for whom? Is taxation to be based on the principle "taxation for the sake of taxation"? Another criticism of a cent percent or a near high levy is that it is not only the owners of land that are benefited by investment in ventures like irrigation, flood control, etc., but the general public, too. Under such a circumstance, such a combination of general and specific benefits does not justify the government to claim the entire betterment from the landowner.

In the U.S.A., in the early reclamation projects, the government did not fix taxes and repayment of loans on any scientific and rational principles. The farmers suffered from mounting indebtedness. Mr. Alexander Joss points out that apart from other evils which can be done to the agrarian sector, thoughtless fixation of assessment rates proved to be detrimental to the morale of settlers in river basin areas of U.S.A.¹ In the projects the Bureau of Reclamation charged rates according to the ability of the farmer or on a *pro rata* cost or *pro rata* benefit. The general practice in U.S.A. is to recover only a portion of the cost of improvement of lands.

Coming to the conditions in India, we find that regarding the quantum of levy and the period of application, here too practices differ. It is the decision of Assam Government that the betterment charge should not exceed 6% per annum on first cost, adding thereto annual maintenance and supervision costs. There is also a provision that in the state betterment charge may be varied subject to not crossing the upper limit of 6%. This is applicable to lands benefited before the commencement of the Act. In Bombay the levy is 50% of increased value and this is payable in instalments not exceeding twenty with 5% interest per annum on the unpaid balance. Instead of cash payment, surrender of a part of land too can be made, the value of which the government will decide. This levy is not applicable to works already completed before and functioning since 1950. In the Punjab the levy will not exceed 50% of the difference in the value of lands. The levy is payable in half-yearly instalments upto thirty with interest. The levy is to be charged one year after the completion of the development schemes. The point of importance in this connection in the Punjab Bill is that betterment levy is not imposed in relation to a scheme where normal charges are adequate to cover the cost and the levy is limited to the difference between investment on the scheme and such part of it as may make it productive. The Betterment Charges and Acreage Act

¹ "Repayment Experience in Federal Reclamation Projects" by Alexander Joss, in *Journal of Farm Economics*, 1945, p. 159.

1953 of PEPSU stipulates that the levy shall not exceed half of the difference in the value of lands with special reference to fixed rates. The levy shall be paid in thirty instalments at the most, with interest on arrears. In Rajasthan the special feature is that the levy shall not exceed half of the difference in value of lands in the pre-project and post-project periods. The charges are payable in instalments with interest as may be prescribed. It may be pointed out that in the Punjab, PEPSU and Rajasthan the levy is applicable in one year after the completion of the projects and that conditions leading to the imposition of levy are identical. Mysore has a different stand in this respect. There is no definite limit for major works but in the case of minor works the rates should not exceed Rs. 200 an acre. It is specially suggested that in case of lump payments a rebate of 7% should be allowed. In the State of Hyderabad the levy is not to exceed 50% of the increased value of land. The charges are to be paid in 15 instalments. There is provision for a rebate of 10% to those who pay in lump sum. The period from which this levy would be applicable starts not earlier than January, 1943. Any voluntary contributions like the ones to Bhoodan movement may be adjusted in the Betterment Levy. This is a welcome provision, for this gives a minor solution to the land problem. In the case of Andhra it is stated that betterment charges shall not exceed one half of the increase in capital value of land. This is to be paid in thirty instalments at least and there is provision for a rebate of 10% to those who pay in lump sum and for the surrender of land of equivalent value. The amount is chargeable on such of those lands covered by projects before the commencement of the Act — not earlier than 15th of August, 1947. In the State of Madras the levy is 50% of the increase exclusive of the initial costs to be paid in twenty annual instalments with 6% in case of arrears. There exists a rebate of 20% if paid in two years from the date of liability to pay betterment levy. In Madras the contribution towards betterment levy is to be shared in the same proportion between the landlord and the tenant as the share of produce.

In our discussion above, we have taken some representative cases. It may be pointed out that in the case of West Bengal, Kerala, Madras, Punjab, Madhya Pradesh, Madhya Bharat, Hyderabad (pre-merger), Assam, Orissa, Saurashtra,¹ and Bihar, legislation has already been passed. Though it is stated in the Second Five Year Plan that reimbursement in the form of betterment levy should be paid in a period of not exceeding 15 years, in some states the period is even 20 years.

From the study of the quantum of betterment and timing of collection and the method, we can arrive at some broad but definite generalisations. Even though the principle of betterment levy is generally accepted by most if not all the states, such general acceptance naturally does not extend to the quantum of betterment that might be assumed by the state. What proportion of betterment should be claimed by the government is bound to be largely arbitrary. There cannot be

¹ The names of some of the States are changed today since the States Reorganisation in 1956.

any serious theoretical objection to the governments apportioning even a lion's share of betterment. Practical considerations as well as the need to provide incentive to the landowners prevent the authorities concerned in a way from claiming the whole. Coming to the other aspect, we may say that the ease with which the levy could be collected depends on the timing of its realisation and the method of collection. We have seen that the payment could be made either in instalments or lump sum or in kind (that is land). Perhaps it would be easy to collect the levy after the landowners had realised at least a substantial part of the benefits from the projects. This would make them psychologically prepared to make the payment since the extent of betterment will by then have been proved. This would also increase their ability to pay. But a fundamental difficulty would arise if the levy is to be claimed only after the extent of betterment is proved and substantially realised. In such a case the collections will be much slower and the governments cannot expect any immediate financial relief.

The wide variety of methods of determination of betterment levy in various States have many aspects in common, and differences are slight. Due to the existence of widely divergent water rates in different states for the same crops, the question of levy of water rates and betterment levy in the areas to be irrigated by the Hirakud Dam Project has been gone into by an Advisory Committee appointed by the Hirakud Control Board. The report which the committee submitted gives us some interesting information regarding the levy of water rates and betterment rates. The report points out that¹ "if betterment instalments levy plus increased profits due to irrigation rates are not more than 50% of the increased profits due to irrigation the collection of betterment levy will more or less be assured." It is thought necessary to consider in brief the chief points in their study of the problem. They took the following points into consideration:—

(1) The expected increase in output when irrigation would be available for supply to the land.

(2) The cost of production of paddy which happens to be the main agricultural crop in the Sambalpur District of Orissa where the study was made in different types of land.

(3) The net additional profit which would accrue to the cultivator per acre for different types of lands.

¹ Vide *Report of the Advisory Committee on the Hirakud Dam Project*, March, 1952, p. 19 (The Committee is otherwise known as Mazumdar Committee, too).

TABLE 1¹

Types of lands	Present average yield in Maunds/Acre	Probable increased yield in Maunds/Acre
Bahal	22	26
Berna	16	21
Mal	10	18
At	6	16

(Source: Central Board of Irrigation & Power, Pamphlet No. 54, p. 101)

The cost of production of rice on the various types of lands do differ and this is evident from the table supplied below:—

TABLE 2

Cost of Production of Paddy per acre in Different Types of Land in Sambalpur District

Items of cost	Bahal	Berna	Mal	At
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Preparatory	13- 8-0	13- 8-0	13- 8-0	13- 8-0
Manure	25- 0-0	25- 0-0	12- 8-0	5- 0-0
Seed	11- 4-0	11- 4-0	14- 0-0	14- 0-0
Puddling and thinning	7-12-0	7-12-0	6-12-0	--
Weeding	13- 0-0	13- 0-0	9-12-0	--
Harvesting	9- 6-0	8- 2-0	6-14-0	5-10-0
Total	79-14-0	78-10-0	63- 6-0	38- 2-0

(Source: *Ibid.*, p. 102).

¹ These figures were obtained by an examination of the crop-cutting experiments conducted by the Agricultural Department of the Orissa State in 1950-51 to 1952-53.

TABLE 3

Derivation of Net Additional Profit Per Acre

Description	Bahal	Berna	Mal	At
Present Average yield/Acre	22 mds.	16 mds.	10 mds.	6 mds.
Present average price of the yield Rs. 7/- per maund.	Rs. 154/-	Rs. 112/-	Rs. 70/-	Rs. 42/-
Present cost of production.	Rs. 79/14/-	Rs. 78/10/-	Rs. 63/6	Rs. 38/2
Present profit.	Rs. 74/2/-	Rs. 33/6	Rs. 6/10/-	Rs. 3/14
Additional yield.	4 mds.	5 mds.	8 mds.	10 mds.
Additional value.	Rs. 28/-	Rs. 35/-	Rs. 56/-	Rs. 70/-
Additional cost (Non-recurring and 10% of the additional capital investment and annual recurring cost due to the use of manure etc.)	Rs. 2/-	Rs. 5/-	Rs. 26/-	Rs. 56/-
Increased profit from paddy crop after irrigation resources are utilised.	Rs. 26/-	Rs. 30/-	Rs. 30/-	Rs. 14/-
Additional profit for double cropping during Rabi.	...	...	Rs. 20/-	Rs. 30/-
Net increase in additional profit.	Rs. 26/-	Rs. 30/-	Rs. 50/-	Rs. 44/-

(Source: Ibid, p. 103)

The Mazumdar Committee has shown as to how levies can be realised from the net increase in additional profit from the following simple illustration:

TABLE 4

Types of land	Additional annual net profit/acre	50% of the additional profit	Water rate per acre	Sum available for annual instalment of Betterment Levy
Bahal	Rs. 26/-	Rs. 13/-	Rs. 8/-	Rs. 5/-
Berna	Rs. 30/-	Rs. 15/-	Rs. 8/-	Rs. 7/-
Mal	Rs. 50/-	Rs. 25/-	Rs. 8/- & Rs. 5/-	Rs. 12/-
At	Rs. 44/-	Rs. 22/-	Rs. 8/- & Rs. 8/-	Rs. 6/-

(Source: Ibid, p. 104.)

(A basic rate of Rs. 8/- per Acre as water charge is arbitrarily proposed for paddy crop and additional rates of Rs. 8/- and Rs. 5/- for cash and light "Rabi" crops on "Ar" and "Mal" lands respectively.) It is to be specially remembered that the suggestion of the maximum limit of 50% of the net increase in profit every year (both water charges and betterment levy) is in accordance with the canon of ability to pay on the part of farmers or landowners. This method seems to be very ideal indeed. "As to why" will be clear from our discussions in the succeeding pages centering round a critical estimate of the betterment levy in the light of Indian conditions. The limit of 50% seems to be the most widely accepted mark in our country so far.

Land taxes, the agricultural income-tax, betterment levy, and the Estate Duty could provide a bulk of fresh resources to the tune of Rs. 230 crores.¹ Legislation providing for the collection of the last mentioned of these taxes has already been brought into force. Land taxes and agricultural income taxes may not be increased under the existing circumstances of the rural and agrarian situation. Betterment levy is the most promising source in such circumstances which may be actively considered. The difficulties of enacting and enforcing the legislation which is necessary for this purpose have been squarely met by many states as was mentioned earlier. It may rightly be presumed that roughly one-third of the capital cost of the major river valley projects can be realised by means of betterment levy. The proceeds can be credited as capital receipts of the relevant government. It is the opinion of the Centre that they can be either utilised for other development expenditure or towards the repayment of loans taken from the Centre. That one-third of the capital cost may be covered by realising betterment levy is, however, only a working estimate. The Krishna-Pennar Estimates are quoted in the table below which is given in support of the contention made above. Both the original proposals for the levy and the A. N. Khosla Committee's Proposals are given which would amply show that betterment levy can contribute a not inconsiderable part of the capital outlay.

TABLE 5
The Krishna Pennar Project Estimates²

	Total cost In Rs. million	Betterment Levies In Rs. million
(a) <i>Original proposal</i>		
Stage I	77.6	10.61
Stage II	130.6	36.10
(b) <i>Khosla Committee's Proposals.</i>		
Stage I	84.82	36.12
Stage II	124.9	48.27
Stage III	132.43	48.27

¹ According to the *First Five Year Plan*, a third or fourth of the capital cost of irrigation and power projects can be recouped by betterment levies alone (p. 368). The outlay for this sector in the First Plan was Rs. 561.41 crores.

² *The Hindu*, 24th Nov. 1954.

This case of Krishna-Pennar Project in Andhra is an example to other states that they could benefit appreciably and that a considerable amount could be tapped for development finances through this source. In actual practice, however, there are difficulties of various kinds in enforcing the necessary legislation. Even in the case of areas like Tungabhadra, where detailed surveys have been made, difficulties regarding the settlement and development have still to be dealt with. Another delicate problem is that in most cases the state governments have the choice of either increasing the water rates or of introducing betterment levy. But apparently they cannot do both. If a betterment fee is collected it is not clear whether it will have to be funded like the irrigation revenue from the water rates.¹ If it is to be funded it is still not clear how much of the fund will have to be diverted towards repayment of loans in preference to expenditure on local works. And, then there are the additional difficult problems involved in assessment and collection.

In the Tungabhadra area a flat rate of Rs. 138/- per acre is collected wherever resettlement is completed and this fee can be realised. This is a promising example and the first major example of substantial levy on a new major project. A fixed rate per acre can be arrived at only arbitrarily, as was said before, of course keeping in view the ability to pay. The administrative difficulties, however, cannot be ignored.

Before closing this chapter, we have to ask quite a few questions and try to find suitable answers. Are betterment levies justified in the light of Indian conditions? What should be the period for the payment of levy? What should be the policy of Government—revised settlements, or betterment levy, or revised settlement-cum-betterment levy? Should there be only a sort of mild betterment levy? Should the levy be pushed too far under a democratic plan, for the immediate realisation of funds to be used for purposes of economic development? Should the surrender of land be made legally compulsory in the event of unwillingness to pay betterment levy? Should the levy be imposed only after the whole process of development in the project areas is completed? (That is, should taxation for betterment be made in the long run or short run?) What is the inter-relation between land tenure and betterment levy? In an economy like that of ours, which is full of many paradoxes, such a barrage of questions are more easily asked than answered. Such questions, if not properly answered, would remain a challenge to our planners.

Let us try to meet a few of the questions posed above, which, in fact, form part of the bigger issue of a critical appraisal of betterment levy in India.

It has been stated earlier that the benefits that a river project provides are of the socialised type in nature. It should, however, be mentioned that only benefits like flood control, navigation, recreational facilities, etc., are so. But utilisation of irrigation water, consumption

¹ This aspect will be dealt with later in this chapter.

of electricity, etc. do not admit of this interpretation. The fact remains that there is a wide disparity in the economic abilities of farmers in our villages and it would be too much to expect that the poorer farmers would be able to pay betterment levy in the short run. The experiences of the Mayurakshi canal area in West Bengal testify to this fact. Though the waters of the Mayurakshi project have been flowing through canals for the last two years or more its effective utilisation has not yet commenced. The farmers in those areas are reluctant to pay the levy at all. Even psychologically they are not ready to pay betterment levy.¹ But, "during the process of economic growth 'betterment levy' should be imposed on those sectors of the economy where an all-round improvement has occurred as a result of the implementation of the development programmes and where the process of generation of economic surplus has been accelerated by means of effective planning."² But when it is argued that a "mild betterment" levy is a necessary concomitant of a bold type of development plan, one is inclined to agree on such an argument. In a democratic plan, however, betterment levy should never be pushed too far, because the main objective of the betterment levy would be awkwardly twisted and the levy would be no better than the compulsory levy usually imposed in communistic countries for extracting economic surplus in a "crude and ruthless manner".³ This opinion merits consideration for more reasons than one. In a country like India where the dearth of capital is felt to the maximum and which depends to a considerable extent on the foreign capital the main emphasis would be to reimburse as much capital as is possible and that too as early as possible without subjecting the farmers to untold miseries. This is planning with tears. In an economy which attempts to launch large-scale enterprises like river projects and heavy industries without, however, tackling, at the same time, the problem of inequalities in economic possession, opportunity and income, this is bound to happen. In such a system if the rate of production and national income are to be increased, it is possible, but with much sacrifice on the part of the under-privileged.

We thus see, on the one hand, that reimbursements of the capital outlay in developmental projects in the form of betterment levy, water rates, etc., are necessary in a period of at least 15 years, according to the Planning Commission, to further other developmental activities. On the other, we find that our farmers are hard put to it in paying betterment levy to the tune of Rs. 277 per acre of agricultural land. Even in a country like the U.S.A. where the economic disparity is not so very pronounced in the agrarian sector, the Bureau of Reclamation was compelled to change the period of repayment from 10 years to 40 years. In India we are faced with a paradox: if we care for the economic welfare of the peasants by allowing them a longer period for the repayment of a part of benefits to the States, the development finances suffer, and if

¹ *New India's Rivers*, (pp. 219-220) by Henry C. Hart.

² *New Horizons in Planning* (The World Press, Calcutta, 1956) by Alak Ghosh, p. 128.

³ *Ibid.*, p. 129.

we are to insist on the farmers' payment in a relatively shorter period of ten years, the people who most deserve help are put to the greatest hardship.

Another important point is that it would take at least a period of five years for actual betterment to be realised in any considerable manner. It is only right to say that during this period no levy should be realised from the farmers. This point is to be fully realised by the various state governments. We may suggest, again, that the realisation of betterment levy should be based on the principle of progressive taxation. For betterment the marginal farmer should be charged the least, and the rate of levy should be made progressive, preferably according to the acreage one possesses. A law should be enacted that the selling of lands should be with the direct knowledge of the government (or project authorities), who will determine a ceiling price on land more than which if realised should escheat to the state. The remarks made by Prof. Gadgil while presiding over the 15th Annual Conference of the Indian Society of Agricultural Economics in December, 1954, contain some reflections which deserve our examination here. He said, "I put forward a suggestion to the Planning Commission that *all lands in the project areas should be acquired for a price*. Crores of rupees are going to be invested in the projects. So initially there should be an acquisition of all lands and later there should be an allocation of developed lands for a price. This gets us logically out of all difficulties. We will have no private interest left in our lands and all developments will be at social cost . . . Thus the project areas will become more or less a clean slate to write on". One can appreciate this viewpoint of Prof. Gadgil inasmuch as this suggestion would accelerate the pace of realisation of reimbursement of the capital investment in river projects. On a closer examination, one wonders whether such a policy, if pursued, would not lead to land being accumulated in the hands of those who could pay the necessary price, that is moneyed men, even if a limit to the area of ownership is prescribed.

Professor S. Krishnamurthy speaking at the Conference mentioned above remarked that to him the most objectionable point was the suggestion that 50% of the lands (be it perennially wet lands or not) be made over in lieu of betterment levy. But perhaps, the idea of surrendering 50% of their lands in the case of large landowners may hold good.

From our study of the problem of betterment levy on agricultural lands so far, we have seen that betterment levy has come to stay. Differences exist only regarding the method of collection, the period during which the Levy should be realised and the pitch of assessment.

And now we shall pass on to another important consideration. Prof. B. N. Ganguli of the Delhi School of Economics opined as follows: "Personally I am opposed to betterment levy. Although it has been said just now that there is no objection to betterment levy, I should say that betterment levy should not be imposed in this way. The

whole process of development should be completed and it is only after that the state should tax the surplus."¹ According to him the community should wait till the process of development is completed and as and when the additional income accrues, let the state levy taxation in order to be able to finance the entire project from the long-term point of view. One cannot fail to appreciate this ethical consideration of an economic problem. In considering Professor Ganguli's above-mentioned opinion, one should not forget to recall his further remark: "Therefore, to me it appears easier for the state to bear not merely the direct expenditure but also the associated cost in the first instance, and then to meet this entire expenditure out of taxation." According to the contentions of Prof. Ganguli this meeting of expenditure is to materialise in the long run. Let us consider a little his viewpoints in the present context. The Planning Commission was very particular in advising the states to legislate for betterment levy realisation even from 1950, not without reason. The anxiety during the First and Second Five Year Plans for the planners has been "Finance". The demand for finance in India calls for the tapping of all avenues in the country. When it is remembered that the funds available from betterment levy would be of the order of about one-third of the capital invested in the projects, we can imagine how imperative it becomes to recommend its early realisation. Practical expediency in the context of present-day planning in India, demands the justification of the realisation of betterment fees in as short a term as possible rather than in the long run which Professor Ganguli appears to recommend.

Finally, we may deal with such questions as to whether, as a part of the reimbursement programme, the state governments should have the present water rates combined with betterment levy, or a single completely revised settlement or a betterment levy-cum-revised settlement. This problem was dealt with at length by the Madras State when it received instructions from the Planning Commission regarding betterment levy, in October, 1950. The Committee appointed under the chairmanship of Mr. C. Subrahmanyam has gone into detailed consideration of various related problems. The vast new projects, which are both protective and productive, will not be justified unless water is drawn quickly and over as large an area as possible. Then, without difficulty, water rates may be pitched high. In view of the culturable area commanded by new projects, the object should be, as stated earlier, to raise the maximum revenue at a generally acceptable rate from the largest number of assesses. The Subrahmanyam Committee recommended the introduction of an element of progression by way of a surcharge adjusted to the ascertained ability to pay, and after proposing, over and above this, an additional surcharge on commercial crops, it proceeded to link both the standard assessment—which forms the basis of taxation—and the water rates, whether on productive or protective irrigation works, to the price index of the first and second sorts of paddy in the Madras State. As a supplementary to betterment

¹ *The Indian Journal of Agricultural Economics*, March, 1955, p. 226.

levy, the modified land tax has proved to be of considerable help to the State government in financing their river project plans. In most states in India the settlements for water-rates are too old and some were settled during the 1920's and 1930's when the price index of agricultural goods were at a low ebb. At a time when inflationary tendency uniformly prevails through the years, the revision of settlements is justified. Revised settlement-cum-betterment levy seems to be a right approach in taxing agricultural lands under the command of a project; at least, it is not unreasonable. If the various states in India follow suit, it is good enough. It is sure that opposition is bound to prevail, stemming most probably from the middle-class landed interests. But opposition there is in getting any scheme of taxation passed through the Legislature. Thus, the revised settlement-cum-betterment levy seems to be an ideal method for the realisation of finance for development projects.

In conclusion, it may be observed that delays in the realisation of receipts are bound to be embarrassing. It is to be remembered that this means not only forgoing receipts at a time when state governments most urgently need them, but it would also involve the State governments in some losses. The important thing at present is not only to ensure that betterment fees are levied but also that they are levied in time. Betterment levy in the present context is for the betterment of the nation. The crux of the problem, however, is: how many peasants appreciate this plain economics?

CHAPTER IX

THE RATES FOR HYDRO-ELECTRIC POWER

Large river valley projects of India are important public utility undertakings and this implies that the state will have to face many problems which privately-owned undertakings need never bother about. In India till very recently power production was mainly a privately-owned undertaking and hence the problem of rate determination was not much important as far as the government was concerned. Now the new river valley projects of India produce large quantity of power and the problem of its pricing has come to the fore.

In a small system or in a private undertaking, rates are usually fixed on the basis of meeting all expenses plus a "fair return" on the capital base. But, in the case of state undertakings, operating large grid systems, there appears to be a strong justification to hold the view that the cost has to be renounced as a basis of rate making. An apparently easy method of fixing the rates seems to be to charge industrial power on the principle of "what the traffic will bear" and indulge in social benevolence at the expense of a higher charge on industry; but there are serious dangers involved in such a course of action. A few reasons as to why the considerations of costs will have to be renounced in the case of a State undertaking might be cited. First, the state has far-reaching responsibilities in regard to

the healthy growth of industry and the development of rural electrification. Secondly, various industries will have to be catered for at rate levels which are acceptable to them in line with the competitive power market and alternative means of generation. Thirdly, it will have to be realised that the rural extensions call for considerable capital outlay but are not productive of good financial returns; at the same time, the rates will have to be such that the power produced might find a ready market.

The experiments made by the T.V.A. might serve as a guide to India in this matter. There is, however, a fundamental difference between the American and the Indian situations. In India, a great deal of new demand will have to be created by keeping the rates at the lowest possible point and a definite rate-base may not emerge for a considerable time. Generally, it is appreciated, however, that no rate-base can remain uncontroversial.

In the disposal of power from Federal Plants in the United States, the public power policy enunciated by the Congress requires preferential treatment for certain classes of customers and the disposal of power at the lowest possible cost consistent with sound business practices. It is the express condition that before the starting of load centres elaborate survey regarding the demand for power will have to be made and the extent of market assessed. For the Federal projects in the West in the USA it is a requirement that power should not only pay its own costs, but also provide assistance for irrigation! In the USA they employ what is technically known as the "power market survey".¹ A power market survey is an investigation to evaluate the present and potential markets for the sale of electric energy in the area proposed for service. The power market survey brings together such factors as load-centre location, water supply, industrial development uses of power, the present economic status of the areas, its prospective growth and the changes which may affect the sale of power. From these various reports the following informations will be sifted out: (1) factors affecting power markets, (2) past and present power supply and requirements, (3) estimated future power requirements and the need for additional generating capacity, and (4) equivalent power costs of alternative fuel plants. With the above points as background, the Federal rate schedules are composed with the following main principles: (a) the rates charged shall be the lowest possible, consistent with sound business principles; (b) the rates shall be such that they encourage widespread use and prevent monopolisation; (c) the rates shall be such that they are sufficient to repay operating costs and other fixed charges during a specific period. There in America they discriminate between classes of service served, namely, wholesale-firm, wholesale-non-firm, retail, irrigation and pumping, and special. In rate determination, no differential is made for service between different groups of customers such as industrial or

¹ *Missouri—Land and Water: A report of the Missouri Basin Survey Commission, U.S. Printing Office, 1953, pp. 142-43.*

privately-owned utility customers or public agencies. There also is in practice the "power-sale contracts". Under this system, the government merely provides that it will sell power under certain conditions and for certain purposes, and the purchaser agrees to pay for it in accordance with the rate schedules and to abide by the various provisions of the contract. The TVA power rates in the USA are fixed in the light of the broader objectives and policies on which the resources programme is based. The TVA programme does not have as its primary objective the development of a power supply; instead, the purpose is bound in much greater social and economic goals, namely, the development of the resources of a basin for expanding economy and improved standards of living. Here power rates are set so as to help attain the programme rather than primarily to produce a profit, although TVA's relatively low level of rates have produced not only a great increase in power use but also a substantial return after all costs and charges.¹ The TVA power rates are something novel as well as controversial, and hence they are studied separately. It has been found satisfactory to determine tariffs for a grid system on considering the following aspects: (a) a comparative study of rate levels in the neighbouring systems; (b) the alternative means for generation; (c) the element of power charge in the economics of large industries which would provide the markets power; and (d) the promotional feature essential for the sale of power in the area of supply. As far as India is concerned the benefits derived from the power produced from a river valley project should be assessed from its "marketable worth" rather than the "capital cost". The problem with the hydro-electricity produced by the Indian river valley projects is that Indian industrial development is still far behind and does not offer a ready demand for electricity. New industries will have to spring up and if exorbitant rates to cover the capital cost of project are charged, such an action instead of providing incentive for electricity consumption, will have just the opposite reaction. If rates are designed to cover the capital cost of river projects, there is every reason to believe that they would be exorbitant, for the capital cost is made up of (1) the direct expenditure for providing the power station, transmission and distribution lines, and (2) a part of the cost of major civil works (such as the dam) which are common to power, irrigation, flood control, etc. If from the revenue realised from the sale of power, the power system operation expenses and the interest and depreciation charges on "direct capital outlay" are deducted, the surplus would represent the benefits of the common works to power.

The tariff rate policy in recent years is sought to be based on the concept of marginal cost. It is to be remembered, however, that the very basis of marginal cost theory is to compare the value of resources used up. For example, when an expense is incurred, certain of the resources are converted to the particular purposes of enterprise. If the final product has greater value than the resources used up, it is

¹ Julian Huxley: *T.V.A.—An Adventure in Planning*, pp. 25-26.

natural that the enterprise continues and if the final product has lesser value then the activities should be cut down. In the case of electricity the major portion of the costs are non-recurring and they cannot be recovered by shutting down a plant. "Marginal cost in the case of electricity can be defined as the increase in the annual cost which results from supplying one more unit per annum". Mathematically put, it is $\Delta y / \Delta x$ that is, the rate of change in cost without output where y is total annual cost and x total annual output. The mean cost there is y/x . It is evident that the marginal cost is the change resulting from a change in output and hence only the costs which vary with output will appear therein. On the other hand, the mean cost is made up of all items including those unrelated to output. It follows, therefore, taking a stable price level for granted, that the marginal cost would be lower than mean cost. The difference between the two will depend upon the difference between output-related costs and total costs. Here in the case of electricity, assuming that a portion of even fixed costs may be treated as output-related, as certain Kilowatts will be allocated to every additional consumer for him to consume, in respect of additional consumers, the difference between marginal cost and mean cost is small as compared with the difference in the case of additional K.W. hour consumption by an existing consumer without increase in his Kilowatt demand.¹ An ideal rate, or tariff, reflects all the services rendered to the consumer and the various parts of the tariffs would exactly correspond to various operations of undertakings. Economic justice demands that each consumer should be made to pay for the Kilowatt hour supplied, the exact cost involved in the production of that. To put it in other words, each consumer should be charged on the marginal cost. This is rather unrealistic even if we take it for granted that a degree of perfection in accounting and computation is attainable.

The above objection needs some clarification. In the face of frequent price changes, when the cost of additional plant to be installed is generally higher and tariff is to be based on marginal cost, it is evident that the charges to be borne by the existing consumers of electricity supplied will be less than those paid for by new consumers even though their purposes may be the same. Though this is not impracticable, it would create a big issue of economic discrimination. The limits of the argument can be further extended to say that from period to period the additional quantity of electricity demanded by the existing consumer will have to be charged different rates of tariffs!

In the determination of electricity rates the "*Value of Service*" to the consumer is an important matter that merits consideration. As has been suggested above a tariff calculated solely on the cost basis might prove harmful. If a uniform rate is charged for heating, lighting and cooking, certain consequences would follow. There would occur a big change in the pattern of consumption. Quite possibly in such an event,

¹ *Rural Electrification*, U.N. Department of Economic Affairs, July 1954, pp. 43-55, for a detailed discussion of this aspect.

much of the capital equipment, particularly of the distribution system, would be badly under-employed, and the cost of supply would rise. This may even render the electricity supply for lighting purposes uneconomical (if charges are increased on par with the increase in cost).

It would be very ideal indeed if tariffs satisfy both the producer and the consumer. This may be put in another way. That is, the undertaking as a whole should be able to pay its way and should never descend to the level of a monopolistic industry. This does not mean that the rate should attempt at recovering all direct and indirect charges incurred in the production of energy, regardless of the value of service rendered to the individual consumers.

D. J. Bolton in his book, "Electrical Engineering Economics", says: "the rules governing electricity pricing are the same in principle as for any other service and commodity. Cost which can be numerically related to consumption variable, should as far as practicable be covered by a corresponding variable in tariff. Other expenses can be loaded as and where they can be met, which in practice will usually mean spreading them according to what the market will bear. Electricity supply differs from other industries only in respect of proportions in which these two principles operate".¹ According to D. J. Bolton, the outstanding principles of electricity supply economics from the pricing aspects are many. There exists a very high ratio of overheads to running cost. Many of the aspects of the overhead costs are indivisible and they cannot be rigidly related to any practicable output variable. There remains always the difficulty that even of the divisible portion those which are demand-related cannot be precisely allocated to consumers through the ignorance of their effective demands on the supply system. Certain portions of consumption which encourages market-bearing methods, have a very high use value. According to D. J. Bolton, tariff determination is to be made facing all these difficulties and therefore "tariff-framers have ample scope for their operations and a correspondingly large margin of error."

The cost of electricity will have to be borne in mind in deciding the tariff or rate. This "cost" may be viewed from a different angle. It is dependent on two major factors, namely, the quantity of energy consumed and the rate at which it is consumed.

It is interesting to study the various types of tariff² that are usually charged: Flat rate Tariff, Multi-purpose Tariff, Two-part Tariff, All-in Tariff Block Tariff, Step Tariff, etc. Even though the overall cost of electricity sold by a river project is the same practically, the rates charged vary with the purpose for which it is used; that is, the use value of the consumer has played a prominent part in the formulation of tariffs. While determining the tariff, the psychological satisfaction of

¹ D. J. Bolton, *Electrical Engineering Economics*, Vol. II, pp. 120-149 for a detailed study.

² For a detailed study, however, reference may be made to *Power System Average Rate and Repayment Studies*, U.S. Department of the Interior, Bureau of Reclamation, January, 1950.

the consumers is also given much consideration. Flat rate type of tariff is the simplest type of tariff. Here charges are made in proportion with the number of units consumed. This is generally in use only in small enterprises. Under the multi-purpose tariff, undertakings supplying power for various purposes adopt a simple modification of flat-rate tariff in as much as different flat rates are charged for consumption for different purposes. Here the basis of the rate is an overall cost inclusive of a reasonable return on capital invested; but the variation in rates is dependent on the principle of what the market can bear. Another important method widely followed by large undertakings producing hydro-electric power for composite loads, domestic and industrial, is the two-part tariff system under which the charges are divided into a standing charge and a running charge. All indivisible charges, consumer cost, etc., come under the standing charge and charge for unit of energy (KWh) consumed on running expenditure is included under the running charge. This method does away with the defects of the previously mentioned tariff systems. Since the two-part tariff reflects to the extent practicable the incidence of charge, it has been largely adopted in many river valley project reimbursement schemes where a systematic scheme of cost allocation does exist. In the case of "all-in-tariff", the method followed is to exact either flat or two-part tariffs and makes no distinction between the purposes for which electricity is used in homes and farms. The other minor types of tariffs are not mainly used often and if at all they are, they are for some special occasions or certain seasons. It has been found by experience in almost all the river projects of the world which produce electricity as well as by other electricity producers that the two-part tariff reflects the incidence of charge more accurately than any other so far evolved in which due consideration is given to the use value of the consumer; it may be regarded that the two-part tariff is the best form as at present.

It may be pointed out that the large quantity of hydro-electricity produced by multi-purpose or single-purpose river projects, is to be distributed generally to the urban, as well as the rural population. As noted in an earlier chapter, one of the main objects of a river valley development scheme is to infuse light and life into the rural areas. Despite all the efforts to bring down the cost of rural electrification schemes, it has, however, been found that the rural consumers are not supplied with electricity at rates which they could easily bear. But, to supply it at rates which they are able to bear, losses are inevitable, at least in the initial stages. The tariffs for rural areas thus present a special problem. Generally it so happens that on the one hand cost of energy supply is higher than for urban areas, and on the other hand the value of service to the consumer is lower. Though considerations of cost do demand higher tariffs, a uniform tariff for urban and rural supply for particular classes is the need of the hour. It seems, therefore, that tariffs which are broadly based on laws of economics and duly modified to take into account all factors influencing production as well as value of service to consumer, might be considered satisfactory.

It might even be that electricity be sold above cost in urban areas and there would be surpluses that could be used for subsidising the rural part of the enterprises. Where does the merit of this approach lie? It is generally expected that rural electrification will pay its way after a few years of operation and in some cases it may even become remunerative in course of time. The direct benefits of such a development would accrue to the consumers of electricity in the form of reductions in tariffs. It may be pointed out that, if need be, some government subsidies might be granted for a small period of time till the multiplier effects accrue in the rural areas.

From the above discussion of the rates for power we can draw some very broad conclusions bearing in mind the fact that the major part of Indian economic development is to take place in the rural areas. As far as India is concerned in almost all cases the rates offered to the rural areas are maintained in the same level as in the adjoining areas developed. The Planning Commission in both the Five Year Plans has laid great stress on rural electrification and has suggested that the state would set up a machinery on the lines in the United States of America.

We might say that in view of the commercial nature of power supply operations, the benefits from the power should be assessed on its "marketable worth". Perhaps this charge might be fixed on the basis of the anticipated revenues over which the power system could become self-supporting. A detailed revenue study should be made at the investigation stage of the river valley projects before deciding the scope of its power development programme. The tendency for speedy reimbursement so that the capital sunk in the project might (in the context of the dearth of capital), compel the rate to be placed very high. This is dangerous as this is not likely to provide incentive for the extensive use of electricity.

It is evident from the above that as in the case of commodities, the sale of electric power is primarily a function of its price. The scarcity of power in India, as in other underdeveloped countries, has made it a luxury for the few rather than a necessity for the many. In Delhi, the running of a stove, a refrigerator, a boiler and a radio, amounted, before the advent of the Nangal Power, to Rs. 80 when the price per unit was 3 annas 6 pies for lights and fans and $1\frac{1}{2}$ annas for power.¹ With the availability of the Nangal power, the rate tariff was converted into the telescopic pattern in which the consumers get a concession for using larger amounts of electricity. With full benefits freely flowing from the Bhakra-Nangal, the rate should further drop for those of the consumers especially in the rural areas. The rate determination in the river projects should be done bearing in mind the rural psychology and the ability of the people to pay. As was stated in the early part of this chapter, in determining tariffs for power the State has to combine business with benevolence.

¹ *The Statesman*, 28-3-1955.

CHAPTER X

THE ECONOMICS OF FLOOD CONTROL

Prior to the development of modern means of communication and transport, rivers formed the most important means of inter-regional commerce in all countries of the world. This naturally promoted large settlements along the rivers. The alluvial plains and valleys of rivers formed by rich silt deposited by them have been the most fertile lands in every country and highly suitable for agricultural operations. Many a city and town is situated in the flood plains. The river basin areas form the economic nucleus of civilized life all over the globe, but these areas are subject to the ravages of frequent floods. It is natural that protection from flood losses should be sought.¹

*Flood control is, in fact, a problem of applied economics in which the social security and protection of life and property must be evaluated in balancing the annual savings from flood control against the cost of construction and the maintenance of flood control works. What are the losses from floods, and what are the benefits obtained if floods are controlled?*² Flood losses may arise in terms of the following exigencies:—

- (1) The destruction or damage caused by flood to the existing real or personal property of a community.
- (2) Losses of earnings and loss of services.
- (3) Increased expense of usual operations.
- (4) Diminution of capital value of lost properties.
- (5) Expenditure caused by flood emergency or a threat of floods, such as, emergency flood protection and flood relief.
- (6) Flood risks to property and life, and
- (7) Agricultural losses.

The benefits derived from flood control may be summed up as the elimination of all the flood losses mentioned above, appreciation of property values, diminution of all indirect losses, etc.³

Indirect losses can broadly be classified into the inconvenience and loss caused by disruption of functioning of railroads, highways and utilities, economic losses to the community as a whole on account of business cessation or disruption not specifically included in direct losses, increased cost of medical care and labour losses. In addition to the above losses and benefits, both direct and indirect, which we

¹ Vide United Nations Flood Control Series No. 2, page 43, ECAFE, Bangkok, 1951.

² A study in detail on flood losses and benefits from flood control may be found in E. E. Foster's "Evaluation of Flood Losses and Benefits", American Society of Civil Engineers, paper No. 2149 (1942).

³ A more detailed discussion follows later in this chapter.

call "tangible" losses and benefits, there are others which cannot be measured in money values and are, therefore, termed "intangible" losses and benefits. The intangible benefits cannot be assigned definite money values although they are now generally recognised to be of great significance in some cases far outweighing the "tangible" benefits in importance. A. L. Cochran in his thesis "Multi-purpose Reservoirs—Their Use for Flood Control" describes the "intangible" benefits as follows:—¹

- (1) Protection of life and health, that is, the reduction of hazards to occupants of protected areas, flood fighting and relief personnel, users of transportation facilities subject to flood damages, crews of rivercrafts, etc.
- (2) Prevention of social dislocations and distress incidental to major flood disasters.
- (3) Improved general welfare of community, resulting from higher standards of development in protected areas with incidental increase in production, higher earning capacities and improved living conditions in the community at large.
- (4) National benefits resulting from reduction of interruptions in communications and general benefits derived from increased production and improved welfare of populace directly affected by protection, and
- (5) Increased national security resulting from protection of industries and communications against interruption by floods during times of war and greater national strength incidental to increased industrial development and improved general welfare of the people.

No measure of the benefits to be gained from flood protection would be complete without an estimate of development. Expenditure on flood control is comparable to fire insurance where the security received is considered sufficient justification for payment of premia even if the fire never occurs. Similarly, a substantial premium for a high degree of security against flood appears justifiable.

As it is seldom economically feasible and practicable to provide flood control works adequate for *complete protection* against all floods, it becomes necessary to decide how much money can be properly invested for flood protection. In making this decision, both the tangible and intangible benefits must be considered. In determining the storage capacity to be allocated to flood control in any reservoir or the discharge to be confined in embankments, the benefits to be gained from various degrees of control of three classes of floods must be considered, such as (1) ordinary floods, (2) floods exceeding the ordinary floods, and (3) the maximum probable floods. It must be remembered that the provision of a partial degree of protection for areas suitable for industrial or residential purposes may be worse than no provision at

¹ A. L. Cochran: "Multi-purpose Reservoirs — Their Use for Flood Control", Vide proceedings of American Society of Civil Engineers, March, 1949, p. 319.

all, as such protection may encourage intensive development in the protected area under a false sense of security with the consequence that extensive loss of life and property may result in the event of a flood in excess of the designed. This very important problem is well summed up by Chandler¹ in the following words:

"However voluminous the base data and however elaborate and reasonable the chain of reasoning, there is no absolute certainty concerning the amount and intensity of the rainfall in any assigned future period; there is still less concerning flood flows and less yet as to the total resulting damages in the future. Rules and formulas assist, but good judgment on the part of the engineer designing flood protection works is also a necessity."

Engineers have always a tendency to aim at perfection and are often led to foresee floods which may occur in 500 years or more, and this considerably increases the cost of the flood control works. With regard to reservoirs in particular, this additional cost may be completely wasted if the reservoir itself is likely to be completely silted up in 200 or 300 years before the flood for which it was designed has occurred.

The determination of the need for flood control and the justification of any available measures for its accomplishment require consideration of many economic and social factors of the region affected as well as of the related problems of water and land use conservation. Perfectly balanced programmes of river basin development in which the inter-relation of all pertinent factors has been adequately considered, can be achieved only if satisfactory means are devised for evaluating the several factors on comparable basis. This would appear to be a reasonable objective for attainment in so far as strictly economic factors are concerned. In flood control, however, and probably in other phases of water and land use, there are many important considerations which are impossible or at least difficult to evaluate in economic terms. This difficulty confronts us as a limitation in our ability to devise water and land use plans which are adequately balanced with respect to the numerous interests affected. Our only recourse is to make our bases for planning as complete and comparable as possible utilising suitable economic terms and all other useful aids to judgment for that purpose.

In so far as flood control is concerned, the basis for planning and evaluating projects should include consideration of the benefits and costs attributable to the proposed flood control measures and the relative need of flood control as compared with the need or desirability of any alternative developments of the land and water resources involved.² An important factor of problem of determining the relative needs for flood control and other developments is the evaluation of

¹ Chandler on E. E. Foster's "Evaluation of Flood Losses and Benefits". Proceedings of the A.S.C.E., paper No. 2149 (1942).

² Vide the United Nations Scientific Conference on the Conservation and Utilisation of Natural Resources, Proceedings, Vol. 5, Water Resources, p. 332.

benefits and costs which is the keystone of flood control and multi-purpose water use planning.

Analysis of Benefits and Costs of Flood Control

What is the purpose implied in an analysis of benefits and costs of flood control of a project designed for that purpose? It is largely to determine if the accomplishment of the project is warranted in the light of all advantages and disadvantages that will result. The benefit-cost analysis is also useful for comparing the relative effectiveness of alternative projects and the relative desirability of various degrees of possible development. What are the benefits and costs or advantages and disadvantages of flood control measures which must be evaluated? The advantageous effects or benefits of flood control projects, as very briefly noted earlier in this chapter, may be grouped into three general classes:—

- (1) The benefit of preventing losses, damages, or impairments of all kinds that result from floods.
- (2) The benefit of improving the utility of property over and above the value of any flood damage preservation involved.
- (3) Collateral or incidental benefits through improvement of navigation, irrigation, power development, pollution abatement, water supply, sedimentation control, fish and wild life conservation, recreation and other activities, which may be associated with projects involving flood control.

The "preventive type" of flood control may be identified in terms of the kinds of losses or impairments prevented. These include loss of life; impairment of health; damage to property; disruption of business, industry, transportation and communications; diversion of effort and materials for flood fighting; rescue, evacuation and re-occupation; impairment of general welfare; impairment of economic security; impairment of national defence ability, and similar losses or impairments attributable to floods. It is apparent from even a general listing of the types of losses to be prevented by flood control that it will be difficult to evaluate the benefit of preventing some types of losses in any terms and that it will be even more difficult to evaluate all benefits in comparable terms.

Many, if not most, flood losses can be evaluated readily in monetary terms. Some, however, such as loss of life and impairment of health, can only be expressed inadequately or not at all in such terms. In flood control planning those benefits which cannot be adequately expressed in monetary equivalents are often of primary importance in the analysis of the justification of a project. The problem of taking such benefits into account is not insurmountable in so far as analysis of justification of flood control alone is concerned, but it is as yet unsolved with respect to economic comparison of flood control with other activities which may be related to or affected by flood control projects. This is a major problem which should engage the attention

of all concerned with the formulation of land and water resources development programmes.

The second general class of flood control benefits, i.e., improvement in the usefulness of property and resources now hampered by floods, is exemplified by the increase in the wealth-producing capability of property which is made suitable for a new or higher use by removal of the flood hazard. The *immediate* benefit of this effect can be evaluated readily in economic terms, but *secondary*, i.e., incidental or collateral benefits, such as the effects on the well-being of a community and stimulation of economic activity, are not conclusively identifiable or measurable. How far we can and should go in tracing and evaluating these secondary benefits of flood control is a question which deserves considerable thought and requires correlation with procedures adopted for analysing flood-control costs, and the benefits and costs of other resources developments.

The cost of providing flood control may be classified in two general groups. First, the resources or goods and services that are needed to establish, maintain and operate the projects; and second, the adverse effects of the projects on the utilisation of other resources. The first group of costs can be evaluated in economic terms with considerable accuracy. The second group may include such effects as disruption of established economic activities, destruction of aesthetic values and other effects which are difficult either to identify or to evaluate or both.

For both benefits and costs it would be of great aid in flood control planning if a procedure could be devised to permit comparable evaluation of all effects from the broadest possible viewpoint. Such a system might involve placing monetary values on effects now evaluated in non-monetary terms or might involve adoption of a non-monetary basis that could reflect both economic and social values adequately. Accomplishment of this objective would probably require many years. Meanwhile, attention should be given to improving and expanding the coverage of evaluation procedures which are now in general use and which are centered around economic value concepts.

The Factors Involved in Estimating Benefits and Costs

The time of occurrence of flood is one of the most important factors affecting evaluation of flood control benefits and costs. In general, benefits accrue from time to time in varying amounts of unpredictable sequence depending on the occurrence of flood-producing conditions of various magnitudes. Costs accrue principally during establishment of the project and periodically during the maintenance and operation of the project over its period of useful life. The benefits and costs must be reduced to a common time basis to permit comparison for economic analysis.

The lack of predictable sequence of flood control benefits can be overcome by expressing the benefits as the average amount expected

in a given unit of time. This is done by determining the probability of occurrence of floods of all magnitudes, in a given unit of time (say one year) and the amount of damage that would be caused by floods of those magnitudes. From these data the amount of damage to be expected, on the average, in any selected unit of time can be computed. The accuracy of computation is limited, of course, by the amount and character of hydrologic economic data on which it is based. The collection and analysis of basic data are of fundamental importance in water resource development.

The problem of adjusting flood-control benefits of types other than damage prevention benefits to a common time basis, is similar for benefits of all water-resource development projects. Various methods have been used ranging from a summation of benefits into a total over a given period of time to a reduction of all benefits to a present worth basis as of the beginning of a project. One of the methods most commonly used is to express benefits as an amount equivalent to the average per year over the assumed useful life of the project. The assumption as to the period of time over which the project will be useful is particularly very important. Most flood control works are of types which will endure physically for very long periods of time or can readily be maintained in good condition for a long period or in perpetuity. The length of time over which they can be expected to be necessary or desirable is dependent principally upon the economic future of the area affected. On this point alone the assumption of a useful life of 100 years or more might appear warranted but because the same period should be used for analysis of costs there is a tendency to limit the assumed useful life-period to fifty years or less. A study of this problem is needed in order that a period can be selected for economic analysis which will be accepted in the light of factors affecting both benefits and costs of all water uses.

Another factor of importance in reducing flood control benefits to a common time basis is the rate of discount or interest on money. It would appear logical that the economic value of any beneficial effect should reflect the viewpoint of the beneficiary and that discount or interest rates should also reflect the beneficiary's viewpoint. This question is complicated by the practical difficulty of identifying the beneficiaries of flood control.

Effect of Price Levels on Estimation of Benefits and Costs

Estimates of the benefits and costs of flood-control and other water resource development projects involve assumptions as to the levels of prices expected to prevail over the period in which benefits accrue more or less uniformly throughout the life of the project, but costs are incurred principally at the outset and to a lesser extent during the life of the works. In order that estimates of benefits and costs may be on comparable basis, it is necessary to anticipate probable price levels throughout the expected life of the project. This is especially diffi-

cult in estimating flood control benefits because of the variety of goods and services involved. This phase of economic analysis merits careful study to determine if forecasts of future price levels can be made with sufficient accuracy to justify their application to the flood control benefits estimates, or, if some other procedure can be devised to ensure comparability of estimates of benefits and costs which will occur at different price levels.

Extents to which the Secondary Benefits and Costs may be Measured

In addition to the more immediate or direct effects of flood control projects which are really identified as benefits or costs, there are numerous secondary or extended effects which must be considered if the economic analysis is to be complete. For example, if a project prevents the loss of a crop, the activities of food processors and marketing agents may be affected. Several questions arise as to whether these secondary effects should be evaluated as benefits of the projects. In some cases the effects may be of a type that would occur whether or not the project is built. Also there may be effects that could be realised by alternative measures. Costs as well as benefits that stem out of the initial impact of a project must be considered. The offsets, cancellations and alternatives involved become complex. This phase of economic evaluation of projects requires intensive study.

Inter-Relation of Several Elements of a Flood Control System

The analysis of the justification for flood control works is often made more complex by the fact that there are two or more projects contributing to the control of floods in the same area. The costs of each of the inter-related and inter-dependent projects which form a flood control system can be estimated separately but it is difficult to assign the benefits to each of the projects, for a number of reasons. For example, in a system of ten flood control reservoirs each of the ten reservoirs will theoretically effect a larger amount of benefit if constructed as the first unit of the system than if constructed as a second or later unit of the ten. Nevertheless, each successive unit added to the system improves the ability of the group to control floods resulting from an infinite variety of flood-producing conditions. This situation defies precise mathematical solution but must be taken into account by some means. An equitable apportionment of benefits of a system of reservoirs can be approximated by assigning to each reservoir the proportion of the total system-benefit that the individual-reservoir benefit bears to the total of the benefits of each reservoir assumed to be acting alone. Such proportioning, however, fails to take into account the relative weight that should be assigned to each reservoir because of various physical factors, such as, probable greater frequency of flood-producing conditions over one reservoir area compared with another. The various physical and economic factors involved in ap-

portioning system-benefits among the several elements of the system deserves intensive study-cum-analysis.

Inter-Relationship of Several Water Uses which may be involved in Flood Control Works

In addition to the complications involved in apportioning benefits among the several inter-related projects of a flood control plan, there is need for evaluation of the usefulness of individual projects and groups of projects on comparable basis with respect to other water uses which those projects served or could be made to serve. This requirement is particularly difficult to satisfy for projects involving flood control because of many important benefits of flood control which cannot be readily evaluated in monetary equivalents, and because most of the collateral water uses are more susceptible to appraisal in economic terms. Uses of water for power and irrigation, for example, have economic values which can be identified and measured more readily than flood control. Effective river-basin development depends on evaluation in comparable terms of the possible alternative uses of the limited water resources of the basin. This phase of water-use and conservation is among the most pressing problems facing those who plan river basin development.

Methods of Payment for Flood Control

The foregoing discussion has been concerned primarily with the evaluation of the benefits and costs of flood control works. Another problem which depends for its solution largely on benefit and cost studies is the method of financing flood control.

In theory it is possible to identify most, if not all, of the beneficiaries of flood control and to evaluate the extent of benefit to each. In practice, however, such identification and evaluation can be carried out to a reasonably complete extent only for the smaller projects and cannot be accomplished satisfactorily for projects of average or greater scope. Furthermore, the recipient of some types of benefits could be identified only as a community, a region or a nation rather than as a single individual or comparatively small group of persons. In the circumstances, assessment of beneficiaries for the cost of flood control cannot be made with precision. Another factor to be considered is whether any activities or developments not benefited by the project are partly responsible for the flood conditions and, therefore, liable to assessment for part of the cost of flood control.

In some cases the benefits accruing to readily identifiable recipients may be more than sufficient to cover the direct costs of establishing, maintaining and operating the project. These known beneficiaries may be willing to bear the entire costs of the project. Only a fraction of the necessary and justifiable control of floods could be undertaken, however, if it were necessary to finance the cost of the works by direct assessment of the beneficiaries. The answer to the question of proper

method for repayment of the costs of flood control lies in the perspective that will be available when the nature and incidence of benefits and costs have been more completely defined than they are today.

In assessing benefits, it must be borne in mind that the money for flood control works had to be provided immediately while the benefits did not appear until later. It was like a loan which always costs more than the sum borrowed because the interest had to be added. This principle applies to flood control projects. Before undertaking a project it was necessary to make sure that the benefits would exceed the total of the cost of the interest on the money.

The control of flood is an activity which is typical of other numerous activities of man in his advance towards the mastery of his world. The means for accomplishment of any particular objective, such as flood control, is capable of development more readily than the means for adjustment and correlation of the accomplishment with other concurrent developments. Our need today is the overall conservation and use of land and water resources.¹

CHAPTER XI

THE ADMINISTRATION OF RIVER VALLEY PROJECTS

Patterns and Problems

The economy and efficiency of a river project is largely and intimately dependent upon the administrative machinery that governs it. Various patterns of administrative machineries might be employed for the purpose. We shall deal in this chapter with the patterns of river project administration in India and a few problems they present.

The National Planning Committee reporting on River Training and Irrigation passed certain resolutions regarding the administration of river projects. The Committee recommended: "To deal with the problems in each major river basin more especially those subject to frequent floods we consider it necessary to have a statutory Authority on the lines of the TVA in USA."² The Report further said that this would especially apply to the Ganges and Indus and possibly to the Mahanadi rivers. Much has happened in India since the Report of the National Planning Committee was drafted. River projects in India have definitely passed on from the stage of talking into that of actual execution. It is interesting to recapitulate our experiences.

The average man in India these days is familiar with current coins like "Decentralized Administration", "Parliamentary Control", "Units of Command", "Undivided Responsibility", etc. It is widely debated

¹ Most of the information here has been freely taken from Mr. George L. Beard's paper "Flood Control" submitted at the United Nation's Scientific Conference on Conservation and Utilization of World Resources and Developments.

² National Planning Committee Report on River Training and Irrigation, p. 115.

whether a Corporation is better or a Control Board. The desirability of joint construction and construction co-operatives is discussed at length. The practice of "unitary control" which was widely prevalent during the pre-Independence days is not yet obsolete. In fact, we have got many patterns of administration in our river planning spread over our land. From our study of the practices in the Western world, we feel that a public Corporation is ideal for river valley project administration. As a case in study, we may point out the instance of TVA as an ideal in economic democracy.

Mr. Henry C. Hart of the University of Wisconsin tried to study the achievements or otherwise of Corporation administration and Control Board administration at the DVC and Hirakud in India. Some of his observations are of interest. After making some brief studies of the Corporation and Control Board working, Mr. Hart says that the efficiency in administration of these two types of administrative mechanisms are nearly the same. He says: "The jobs that these agencies tackled are so nearly the same that their success can be measured by a common yardstick. Here by sheer good fortune is an opportunity which no other nation possesses; to put the alternatives side by side and select those governmental arrangements for future rivers which have turned the resources of the Damodar or the Mahanadi to the best account." Mr. Hart states further: "India is in the singular position of having a fair comparison in progress between Corporation and Code. The experiment is coming to its conclusion before the governmental arteries have hardened, while she is still considering how to enact and execute her next great agenda of river valley developments. It is this sort of opportunity which nations generally have unexploited. . . . But in this as in so many other ways India may turn out to be unique."

Let us begin our study in detail. The first ever river project that was swung into execution was the Damodar Valley Project which was administered by the Damodar Valley Corporation, established by the D.V.C. Act finally passed in March, 1948, by Parliament.

The kind of administrative set-up envisaged in the DVC Act, March, 1948, was unanimously adopted by the three governments concerned: The Centre, West Bengal and Bihar. On what considerations did the case for Damodar Valley Corporation rest? The very first consideration was that the Damodar river development involved the complex and delicate aspect of the involvement of three governments. This could be most effectively tackled by a separate statutory body. The second consideration was that the integrated development of resources would continuously give rise to problems which would impinge on one another. In the use of a river project there may be conflict in the use of resources, for Flood Control, Irrigation, Hydro-power, Navigation, etc. The National Resources Board of the U.S.A. characterised the problem of water resources control and conservation as one

¹ Henry C. Hart: *New India's Rivers*, pp. 144-166.

² *Loc. cit.*

of "multiple adjustments". In the river project administration, inter-relation of physical factors, interests and responsibilities makes development and control a problem of multiple adjustments. This inter-relation of various factors make control of water resources a difficult problem. Perhaps this type of inter-relation of factors to the best advantage could be worked out by the creation of a separate autonomous body—"Corporation", or Valley Authority. Another foremost task in the development of a river basin, as already mentioned, is that attempts are to be made for the fullest possible utilization of water and power so that production of wealth may be maximised and a reasonable income earned so that the projects may at least pay their way. Even if it be that the motive behind some river projects or others is purely a welfare measure, the fact remains that benefits should be achieved at the lowest possible cost. The commercial aspects can best be safeguarded by a public corporation working on the lines of a large-scale business enterprise. In a democratic set-up of state functioning, political forces unless held in check may easily play off with economic problems. With the expansion of state enterprise it becomes absolutely necessary to ensure their running strictly along business lines so as to be conducive to the larger interests of the nation. A statutory public Authority or a Corporation with its own rights and responsibilities could do this business most efficiently both in the interests of the state as well as the common masses.

Addressing the D.V.C. staff, Dr. A. E. Morgan, the first Chairman of the Tennessee Valley Authority, once made the following observations: "There lies ahead of India a great expansion of economic activities in many fields. One way to administer such activities is by increasingly large bureaucratic activity and organisation. Another way is by public corporations which while strictly responsible to government have the freedom of action of private corporations. In this way the management of public economic undertakings can be brought to more manageable proportions. India doubtless will try both these methods and will learn from the resulting experience. The public corporation should have a full chance to prove itself. It should in fact as in theory have freedom of action."

We are still too near the commencement of the new era of river planning in India and hence cannot give a final verdict on the lessons of the Corporation method or Control Board. In India as in many other countries experimenting with public corporations, the entire working of the Corporation method depended and continues to depend on five fundamental factors. They are: (a) the quality of the statute creating a Corporation, (b) the calibre of the Board of Directors, (c) the financial powers of the Board, (d) the relations between the Board and the Minister, and (e) the relation between the Minister and the Parliament. It is necessary to examine these five aspects in the history of development of the D.V.C. so far. The basic principles which should be satisfied for the efficient functioning of public corporation are allocation of functions, clear enunciation of broad policies, clear-cut delegation of powers which must be commensurate with the functions,

flexibility of operational methods, full accountability for results, and to ensure all this there should be the delegation of fixed and undivided responsibility.

We see that Section XII of the D.V.C. Act explicitly lays down the functions of the Corporation but no attempt has been made in the Act to indicate the broad priorities among them. As noted earlier, the various aspects of river basin development may be fundamentally opposed. Such conflicts should for efficient working be resolved as far as possible through policy directions in the Act itself. It is found in the Act that though flood control should be given priority number one, in the actual list of functions it figures after irrigation and power. Similarly the Act is rather vague as far as the need for experiment and research to attain fuller utilization and better distribution of power. Regarding the purchase policies to be followed by the D.V.C. the Act is not very clear. How far access the D.V.C. could have into the various state departments is also not so clear. When the headquarters of the D.V.C. was located at Calcutta, it produced a lot of resentment and angry exchanges. In this context we might remember that the TVA Act provided for the maintenance of its principal office within the Tennessee Valley itself.

The D.V.C. Act is completely silent about personnel policy and internal management of the Corporation. In the absence of any statutory direction in this field, though the Corporation was intended to adopt an enlightened personnel policy based on the merit system and the management practices of a modern commercial enterprise, it may drift only too easily towards the stereotyped rules and regulations of the government departments. The Act merely enjoins that in the selection, appointment and promotion of its employees no political test or qualifications shall be permitted or considered, but these should be done entirely on the basis of merit and efficiency. Another vague point in the personnel policy of the D.V.C. is Section 3 of the Act which exempts the Authority from operation of Civil Service Laws, directs the Board of Directors among other things to define the duties of its employees and to provide a system of organisation to fix responsibility and promote efficiency. Still another point to be made is that the Act confers undefined powers to discharge ill-defined responsibilities. It is to be admitted that Statutes of Public Corporations should not leave any doubt on such fundamental issues. A clear demarcation of the area of its autonomy with utmost possible clarity is very important. For example, section 48 of the D.V.C. gives power to the Central Government to issue directives on questions of policy by which the Corporation shall be guided in discharging its functions. It further goes on to provide that in the case of doubt as to whether a question is or is not a question of policy, the decision of Central Government shall be final. This leaves room for vagueness and indecision, if not curtailment of autonomy. The main policy issues should have been clearly decided when the Bill was passed and not afterwards, if sound administration was to be ensured and future troubles avoided. It is a

significant matter that according to the D.V.C. Act the Centre has retained extensive powers to make rules. In a similar fashion, the approval of the Centre is required in case the Corporation wants to finalise certain regulations. This is clearly a curb on the autonomy of the public corporation idea. Why? Because the corporation is made subject to the usual departmental red-tapism which eats into the autonomy of corporations and thereby vitally affects the management practices of the Authority, managerial flexibility and the corporate freedom.

How should the Corporation function so far as the financial sector is concerned? The Act provides that the entire capital required for completing the project undertaken by it shall be provided by the participating governments. It says that the participating governments shall have to provide their respective shares within a specified period. In the event of their default the Corporation might raise loans to make up the deficit or cover the contributions unrealised from the government concerned. Perhaps these appear to be over-generous provisions. It is to be specially remembered that it is the Centre which in practice provides the share capital of the states concerned and it may be so stringent during certain years that the allotted funds may not meet the actual requirements of the Corporation. There was actually no provision for a long-term financial requisition according to the D.V.C. Act. Should provision for such a requisition be provided, then annual supply of funds would have become more or less an automatic affair, subject, of course, to any emergency increment or cuts. These are some of the loopholes in the Act, but these shortcomings of the Statute should not be exaggerated. The fact remains that in spite of all these shortcomings a foundation has been laid for a gigantic public corporation in the Damodar Basin. The fundamental problem is: "How such an Act is worked, much more than what provision it may or may not contain".

Today, the opinion is current that in running a large-scale undertaking, a Policy Board is better than the Functional Board. The Functional Board of a Corporation has got two main weaknesses. Here the functional director becomes overloaded with details of even minor aspects of the projects which could safely be left in the hands of people at the lower level. This leaves him not enough time to deal with major policy issues. It is natural that under a Functional Board there would be so many departments, each separate in its own way. But the problems to be solved are often, if not always, interconnected. According to Prof. Robson, "A governing board should not be a collection of men in charge of departments but a closely-knit body bringing their collective judgment to bear on all the large questions of policy".¹ Policy is not the sum total of specialist parts. The views and data produced by experts do not of or by themselves produce a policy. A Policy Board calls for a radically different composition

¹ For a detailed discussion refer Prof. Robson: *Problems of Nationalised Industry*, London, 1952.

from a functional one so that once a Policy Board has been set up it must function as such.

From the above it is clear that autonomy is the sheet-anchor of a public corporation. It is on this that a corporation stands or falls. There has been a lot of talk about the status of the Financial Adviser to the D.V.C. One fundamental question may be raised here: How much financial control should be granted to the D.V.C.? All these years those who were against the institutional innovations have been astute enough to insist on an independent status for the financial adviser; by doing so they have refuted the very sanctity of public corporation idea. What is the role of the financial expert in a river project corporation? We shall assume two things. One is that there must be a high-standard financial business judgment available to the Board. The judgment must be timely and most effective. It is also necessary that the speed and efficiency of the entire organisation must not be hampered in any respect. Supposing that a high level of financial and business judgment has been ensured, the rest of the financial functions could be entrusted to a treasurer. In a large undertaking, with heavy capital investment, it is often considered more appropriate to appoint a comptroller, instead of a treasurer, with a properly organised internal audit division under him, who like other executives of the organisation reports to the General Manager. This is the set-up that has been adopted by public corporations like the TVA.¹ Perhaps this is the only way in which the twofold objectives mentioned above, namely, sound financial judgment and efficient functioning can be safeguarded. If the full responsibility for the final results are to be fixed fully on the Board, the adoption of such a set-up is highly imperative.

As far as we know, in the government the department-treasury relationship is based on the fairly old concept of "checks and balances". In a private enterprise all divisions including finance are dovetailed into one whole. An industrialist or a businessman knows pretty well that the first condition for success of his enterprise is perfect teamwork and co-ordinated drive. Thus we see that finance occupies the position of a servant of the Board and the live-force or tool of management. This is equally true in the case of public corporations. In fact, by far the most important motive behind the creation of such corporations is to take full advantage which characterises a private enterprise and makes for its speed and efficiency. To set up a public corporation and then fall back upon the "checks and balances" system is as good as throwing away the biggest single advantage of the corporation itself.

A public corporation, quite unlike a government department, functions without the orthodox treasury control over its finance and personnel and also without the continuous direction and guidance of a Minister. These are the two pillars of corporate freedom. If these freedoms are given, a corporation can adopt the best management practices from the fields of private enterprise. Section 48 of the D.V.C.

¹ TVA, by Herman Pritchett, U.S.A.

Act confers wide powers of control on the centre. In fact its scope is much wider than that of corresponding provisions in the statutes of nationalised industries in Britain. As already noted, the Centre according to the above provision can issue directions on any questions of policy. The Centre alone decides the issue of policies. Here is no limitation to this extraordinary powers of the Centre. There is a feeling among the protagonists of the Corporation idea that in India the *de facto* control exercised by the government has become both extensive and substantial. This if pushed too far, it is feared, would bypass the specific provisions of the corporation idea itself. Then, where does the proper role of Parliament lie? The ideal method seems to be (1) that in the case of public corporations entrusted with the functions of a technical nature as is the case of D.V.C., parliamentary control should be restricted to important policy matters and not extended to their day-to-day management, and (2) that in deciding matters of major policy Parliament should never direct details of administration. If unrestricted parliamentary interference were allowed, half the justification of having a public corporation rather than a government department, would be gone. If it is desired that the full freedom, independence and flexibility of the public corporations must be combined with complete answerability even in minor details to Parliament, it is better to give up the corporation idea altogether. If the public corporations are to succeed in India, Board-Minister-Parliament relations must be straightened out and their respective areas of responsibility should be demarcated with utmost possible clarity. New and healthy conventions are badly needed.

The efficiency of public corporation working in the river project spheres can be enhanced by instituting a general investigation periodically. In Great Britain the practice is to appoint Royal Commissions. In India also some such attempt was made when the now-famous P. S. Rau Committee¹ was appointed to investigate into the affairs of the D.V.C. If these investigations are to be of any real value, they will have to be more than mere investigations. An unbiased and critical estimate of the achievements and failures, if any, of the corporations should be placed before the nation. It will also be well if some constructive suggestions also could be placed for increasing the administrative efficiency of corporations by such investigation bodies.

The question of the best administrative set-up for India's river projects continues to trouble many thoughtful minds.² At the second Engineers' Seminar held at Roorkee in 1954 under the Chairmanship of the then Irrigation and Power Minister, this issue was debated without reaching any conclusive results. Control Boards came into existence

¹ The Administrative Committee of Enquiry headed by P. S. Rau pleaded for semi-autonomous corporations in River Project Administration, vide p. 115 of the Report.

² A. D. Gorwala's "Report on Efficient Conduct of State Enterprises", New Delhi, is the result of such disturbed thought on the part of the government. Refer p. 14 of the Report, where a case against too much of controls by Centre is made.

in Kosi and Hirakud projects. These have been found necessary in order to achieve a speedier flow of decisions. With so many other river projects in the offing this subject acquires an extremely over-riding national importance. By far the most crucial issue in this context is the Department vs. the Public Corporations approach. The proper distillation of lessons from the past has hitherto proved a baffling task as is evident from the D.V.C. Enquiry Committee's Report. The Report provides an illustration of one official report contradicting another. It is well known that Paul H. Appleby's services were requisitioned by the Government of India to make an enquiry into and give suggestions for the improvement of Public Administration in India.¹ Mr. Appleby commenting about other things on the value of setting up corporations in public sector argued for their *status quo* of public sector. But he was out for a considerable degree of control over corporations. The Rau Committee Report on the whole presents the case for autonomy. We may note once again that in India there is a general bias against delegation of autonomy to Corporations. It appears that Parliament is jealous of parting with power in this sphere, too. In 1953 a parliamentary committee, namely the Public Accounts Committee, endorsed the Comptroller-General and Auditor-General's verdict questioning the propriety of setting up limited companies wholly owned by government which are removed from Parliament's direct and immediate control, and these observations apply also to other corporations. In any case, there has recently been a tendency in the Centre to duplicate work, to think that there is some wisdom in reconsidering proposals put forward by corporations and to query everything. In these circumstances, in the absence of conventions such as those regulating the D.V.C.'s relations with the Central Government, statutory and subordinate bodies have themselves been unwilling to undertake responsibility.

These various factors may be explained in terms of financial dependence of the corporations on the Central Government. In case the so-called autonomous bodies mean that if their schemes are so sound that they need not be considered and reviewed so constantly they could have preferably got away with a considerable measure of autonomy in practice.² The history of corporations in the U.S.A., as it happens, strikingly illustrates this basic fact. It seems that certain means of resolving the conflict between governments and corporations will be for the corporations which have so far been set up in India to aim at financial self-sufficiency to the extent possible. In the existing circumstances, however, that is, granted that the Indian corporations will for some time continue to be more or less wholly dependent on the government, it is necessary to consider the case for autonomy which the

¹ Paul H. Appleby, *Public Administration in India*, Report of a Survey, New Delhi, 1953.

² "A Report on Organisation and Administration of Nationalised Industrial Undertakings," Lok Sabha Secretariat, New Delhi. On pp. 2-3 of the Report one finds a similar viewpoint for the encouragement of private funds besides giving scope for decentralisation.

Rau Committee Report pleads for. Very briefly put, this is a case against the waste which results from the existence of two parallel governments (one of corporations and the other of state). The corporations have an immediate and direct responsibility for carrying out the tasks which have been entrusted to them but the governments have only much vaguer responsibility and in any case are not closely identified with the projects in public mind. The most difficult disadvantage lies in the question of choices, as there may be no means of saying whether on any given matter of policy the corporation concerned or the government is right. It must be recognised that an autonomous corporation has as much chance of being right as the government itself. The Rau Committee suggested that once a choice has been made and a Corporation has been brought into existence, there must be no going back on this decision. If only autonomy is conceded, the autonomous corporations will be in a position to evolve business methods for themselves. This will be economically justified because the agency concerned will be able to cut delay, eliminate waste and accelerate the process of economic development. The main recommendation of the Rau Committee in order to ensure the above is that the Central Government should confine itself to giving directions and that it must be answerable to Parliament only as far as these directions are concerned.¹ This recommendation has the advantage that it delimits the powers of the Centre and if the directives are only confined to major questions of principle, there is no reason why satisfactory solution should not be found.

We may sum up our study of Public Corporations: "The underlying reason for the creation of a modern type of public corporation is the need for a high degree of freedom, boldness and enterprise in the management of undertakings of an industrial or commercial character and the desire to escape from the caution and circumspection which is considered typical of government departments."² An ECAFE seminar³ opined that "where an enterprise is wholly government-owned it should be set up in the form of public corporation or in some cases administered as a department of Government". Public corporations have come to stay in India. It is a matter of disappointment that they have failed to work satisfactorily. In most of the cases, however, there has been too much interference by Ministers concerned. The case of D.V.C. is one in illustration.⁴ In actual practice, it has been noticed that these undertakings are treated in the same manner as department and offices of Government.⁵ The exercise of too much of official and

¹ Refer Rau Committee's Report, Chapter On Recommendations.

² William A. Robson "Problems of Nationalised Industry", London, 1952.

³ Seminar on the Organisation and Administration of Public Enterprises in Industrial Field (held in Rangoon on March, 1954) under auspices of various UN agencies, U.N. Publications ST/TAA/M/17, p. 14.

⁴ See Report of the DVC Enquiry Committee, 1952-53.

⁵ See Estimates Committee Report, 1954-55.

non-official control by Central Government authorities is harmful because this leads to persons in charge losing their initiative and enterprise. It is a "must" for a corporation to have a large measure of autonomy in day-to-day administration. The most problematic aspect of public corporations in India at present seems to be the relationship among Managing Director (or Board of Directors) *vis-a-vis* the Minister and Parliament. The best policy, as was hinted before, seems to be that the Board should be directly responsible to the Minister in the matter of broad questions of policy. The Board might be assisted by an Advisory Body as suggested by the Estimates Committee consisting of representatives chosen from among businessmen, workers, customers, members of Parliament and local legislature. The crux of the problem is how to safeguard local national interest without encroaching upon the administrative independence of the Boards without usurping their managerial ability.

Control Boards

Let us now take up for discussion another form of administrative set-up for river projects, known as "Control Boards". These Boards are non-statutory bodies, also known as Advisory Boards. The Bhakra and the Hirakud projects have this type of administration. It seems that, of late, control boards are being favoured by India Government. The pattern of the control boards may vary according to circumstances and requirements. An examination of the main features of the Bhakra Control Board would give a rough idea of the functions of such Boards. They are set out below:—¹

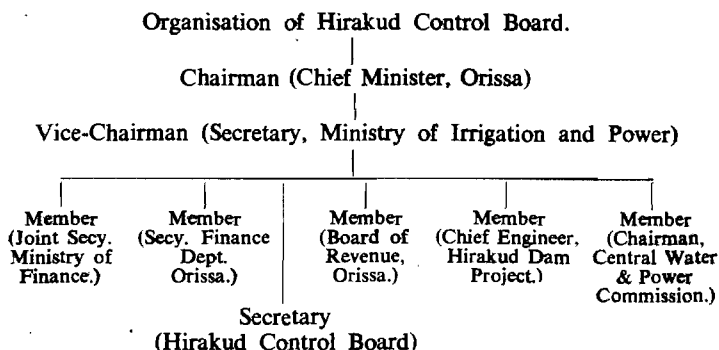
- (1) To scrutinise the estimate of the project, advise necessary modifications and recommend the estimate for administrative approval.
- (2) To examine and lay down where necessary specifications and schedule of rates for various items of work with a view to sound and efficient execution.
- (3) To examine and approve from time to time the delegation of such powers both technical and financial as it may deem necessary for the efficient execution of the project to the various categories of officers working on the project.
- (4) To approve of the proposals for award of work or supplies on contract other than those based on public tenders.
- (5) To approve of special estimates and contracts the cost of which exceeds the sanctioning powers of Chief Engineers.
- (6) To decide the programme of construction of different arms of the project in all three participating States of Punjab, and Rajasthan and PEPSU.

¹ From a Monograph "Some aspects of Benefit-Cost Studies of River Valley Projects" by C. S. Parthasarathy, Planning Commission (Under sub-head 'Organisation').

(7) To decide on the State development of power and withdrawals of water from the reservoir during the construction period for irrigation and power purposes to secure most optimum and economic use of available waters.

(8) To obtain monthly progress reports and review the progress on different units of the projects and lay down such steps as may be necessary to expedite work.

The organisation of the Control Board at the Hirakud may be seen from the following chart.¹



The Hirakud Project Organisation was originally divided into two branches and the Control Board came into the picture much later. The Construction Organisation and the Land Development Organisation were the two original branches. The Construction Organisation dealt with matters connected with the actual construction of the dam whereas the Land Development Organisation placed under the control of the Orissa Government dealt with matters relating to land acquisition, reclamation and resettlement, and development concerning the Hirakud project. However, with the experience gained, it was found necessary to delegate larger powers to the Hirakud Organisation so that the decisions that are taken might be quick and actions expedited. It was found that if every matter was to be placed before the Central Government for approval, it would cause inevitable delay. This also was one of the reasons for the evolution of the Hirakud Control Board. In 1952, the existing arrangement was revised and the Hirakud Control Board under the Chairmanship of the Chief Minister of Orissa was constituted with two representatives from the Centre and two from the State. It is this Board which has been placed in overall charge of the project including technical and financial aspects under the general supervision of the Government of India. The Chief Engineer of the project was directly responsible to the Control Board and the Irrigation and Power Ministry of the Government of India. The Hirakud

¹ *The Story of Hirakud Dam Project*, Govt. of India Publication, 1957, p. 80.

Control Board got the assistance of a Development Board which was under the chairmanship of the member, Board of Revenue, Orissa. The resolutions and decisions of the Control Board were recommendatory in nature. Government sanction wherever necessary was being issued by the Government of India or Orissa as particular items required. The Chief Engineer in charge of the project organisation was expressly and directly responsible to the Government of India through the Hirakud Control Board for efficient administration as well as general professional control of public works on the project. The Chief Engineer had been delegated large powers to contract for works, supplies and services on behalf of the Government of India. Under the revised administrative set-up, the entire organisation of Hirakud is under the Chief Engineer in the overall charge of the Hirakud Control Board. It is claimed that with the larger powers delegated to the Chief Engineer the execution of project works with speed and efficiency was possible.

The somewhat detailed examination of the working of the Control Board type of administration drives home one important point: the efficient working of any project may not be possible under strict control of the Centre, and it is possible only with the delegation of powers to men at the helm of affairs. This means the delegation of autonomy to project authorities. One point becomes crystal clear: be it a Corporation or Code, it is absolutely necessary for the Central Government to believe in the autonomy and freedom of the Corporation or the Code in charge of regional economic development or river planning. One cannot ride two horses at a time, for it is easy to fall between the two! Perhaps this is the precious lesson that our over-centralized machinery at the Centre has to learn from the Damodar Valley Corporation and Hirakud Dam Administration experience. There remains the very difficult problem for the Centre: the problem of selecting the right and most efficient men to be in charge of river projects and their administration. This is a very difficult problem. In selecting the Chairman and members of the Board for the Tennessee Valley Authority in the USA, the American Presidents have had to make such difficult and important decisions. The selection of Arthur Morgan, David Lilienthal, Gordon Clapp, and so on, as Chairmen to the TVA from time to time, was made by the successive Presidents of the U.S.A., after a good deal of thought and heart-searching. In India, too, for guiding the destiny of the various large-sized river projects such careful selections have to be made. The fate of a project depends to a large extent upon the genius of men at top. We have able men and the problem for the Centre is to spot them and clothe them with the responsibility of nation-building. This is the best that the Centre can do and if it succeeds in doing so, the rest of the matter becomes easier. It is high time the Centre gave up the trend for controls and curbing of autonomy.

Joint Construction and Construction Co-operatives

To make our study of river project administration a little more comprehensive, we may now briefly examine two other aspects, though

not as important as the ones we have discussed so far. They are "joint construction" approach and "construction co-operatives".

In India there are cases where joint construction of dams has been done through the co-operation of more than one State. The case of Tungabhadra project is an example. The dam constructed there has been the result of co-operative effort of the Madras and the then Hyderabad governments. Each half of the dam was constructed by Madras and Hyderabad. Wherever and whenever found necessary, meetings and consultations were held by the Chief Engineers of the respective governments. Whenever major differences of opinion or approach arose the matters were referred to a mutually-accepted Chairman for final decision. The dam was completed without any serious hitch between the governments. Even in the D.V.C., Bhakra, Chambal, Machkund, etc., we have examples of joint construction. But this method cannot be applied to the large-scale economic development programmes under river planning. In so far as the construction of a dam or an irrigation or inland water canal is concerned, this type of approach might be possible. But in large-scale river planning where, as just noted, decisions on various aspects of economic development are to be made, and multifarious constructions to be pushed through, joint construction might not be useful.

Construction Co-operatives deal only with actual construction matters in a river project. The merits and demerits of the system of large-scale contract in public works projects are well known even to laymen and hence they are not being mentioned here. The main idea behind construction co-operatives is that governmental departments should primarily concern themselves with planning and technical features of public works and leave the actual execution to a different organisation. This different organisation for construction might take the shape of co-operatives (which will be responsible for construction), or self-supporting organisations. They might be able to reduce the cost. The advantages of co-operatives might be improvement of the quality of works, reduction of costs, elimination of corruption, and kindling of local initiative, leading people to partake in the actual execution of plans. But this type of construction co-operatives can be organised under a Corporation, or a Control Board or Joint Construction.

We shall conclude our study of River Planning Execution and Administration in India with one more observation. If it is the construction of dams and canals that is needed, this function may be performed by a Corporation or a Control Board. But river planning as we have seen so far is something more than mere construction of dams and canals. A river basin development programme is a form of long-term regional planning. Many more aspects remain. For example, take the land development aspect under the command of a river project. Then, there is the aspect of multiple effects that are bound to emerge after the project execution, and that are to be channelled in a proper way. For this very important aspect the Control

Boards would not be of much use. A Corporation in charge of a river basin is a permanent body and, aided and advised, among others, by economic experts, can tackle all problems from project execution to all round economic development, including land development. The significance of Corporation in the proper development of a river basin is supreme. This significance has been proved by the T.V.A. in the United States which tackle the agricultural as well as industrial, and even social as well as cultural problems. India might as well draw inspiration from the same. The difficulties that we have had with our very first river development corporation (D.V.C.) may be looked upon as merely the birthpangs of a new system and development itself. Once the government and the people recognise the role of a Corporation in river basin development, it is to be hoped that the Corporation idea will receive increasing support both from the public as well as the government. We may conclude that for the full economic development of India's river basins the administrative mechanism that seems to be the only and the ideal one is "CORPORATION".¹

CHAPTER XII

RETROSPECT AND PROSPECT

We have so far discussed some of the theoretical and practical implications of programmes of multi-purpose river valley development projects, particularly those that have been designed and put into operation within the plan-frame in India. It is permissible now at the end of our discussion to ask the question: Were the river projects of India well-conceived and have they since been efficiently executed? And, then there remains the far more significant poser: Have the river development programmes contributed materially to the "development" as such of India's economy during the last several years of their planning, operation and execution?

We shall try to summarise answers to these questions in the light of facts and materials that we have been able to gather and piece together in the preceding several chapters, and in the context of the progress reports and evaluation statements that have been latterly made available to us.

It is evident from our study that in each stage of river planning in India very many problems arose—problems of the sort which did not quite confront other countries. Still, however, her achievements in the field seem to be quite impressive. This we can understand from the evaluation report of the First Five Year Plan. It is not feasible to measure the achievements in the fields of flood control, sanitation,

¹ Though published in 1953, before the wider implications of the Corporation *vis-a-vis* Control Board were experienced, Dr. Sudhir Sen's article "We need more River Valley Authorities in India", is a very strong plea for D.V.C. — T.V.A. approach. Vide, *Indian Journal of River Valley Development*, 2nd Annual Number, 1953.

etc., in terms of statistics. But the statistical evidence of the achievements in the field of irrigation and power aspects of the river resources plan appear rather convincing:—

	Target	Achievement
Acres Irrigated by medium and large projects since 1951 in millions ...	8.5	7.0
Kilowatts of Electrical capacity installed since 1951 in millions ...	1.1	1.1

In other words, 100 per cent of the power capacity scheduled to be built by 31st March, 1956, has in fact been achieved and about 82 per cent of irrigation. We have noted that only 5.6 per cent of India's water potential was actually put to use before 1951. At the end of the First Five Year Plan it came to 10 per cent. The installed power capacity in the country including the capacity owned by self-generating industrial establishments was 2.3 million KW at the beginning of the First Plan. At the beginning of the Second Plan this increased to 3.4 million KW. The Second Plan envisages to raise the production to 6.9 million KW. It is the claim of the Irrigation and Power Ministry of the Government of India that when all the schemes of the First and Second Five Year Plans are implemented, the total irrigated area in the country will be about 109 million acres which is more than double the irrigated area on the eve of the First Plan. If the irrigation target of the First Five Year Plan could not be fully achieved, it is because of the fact that some of the major and medium irrigation schemes spread out over the First and Second Five Year Plans. Making allowance for the inevitable difficulties and bottlenecks, the achievement seems quite commendable. The First Plan was instrumental in raising the National Income by 17.52 per cent and the *per capita* income by 10.4 per cent. It is understandable that it is not possible to estimate accurately as to how much did river resources plan contribute to this increase. But it is obvious that it must have contributed a quota, however small, to the total achievement. It may be recalled that 262 major and medium schemes were taken up during the First Plan period which cost about Rs. 700 crores and promised a potential irrigation of 22.3 million acres. Of these about 80 schemes were completed and the rest are on the way to completion, as part of the Second Five Year Plan. It is agricultural production that can perhaps be taken as the right index for assessing the role played by irrigation to the development of our economy. Crop-output statistics go to show that 64.8 million tons of foodgrains were produced in 1955-56 as against 54.0 million in 1949-50. It is to be admitted that this figure is quite impressive, more so when viewed in the light of the fact that the technical, economic and a host of other hurdles stood in the way of increased food production. Again, an assessment of the economic benefits accruing from the power development can be made only by analysing the purposes for which electricity is used. A considerable portion of the electrical energy produced in the country (66 per cent in 1955) is consumed by large and small industries.

Electricity is used for lift irrigation purposes and 12 per cent is used for domestic purposes. From this, it is clear that a large percentage of electricity produced is utilised directly for productive purposes. We have to remember that the river projects can hardly be expected to yield all the calculated benefits immediately. It is beyond the period of the Plan and perhaps outside the progress statistics quoted above that most of the tasks of putting water and power to full productive uses would lie. The task of the First Plan was only to start our river resource-development planning and it would perhaps be too much to hope that benefits and costs would tally at the end of the very First Plan period. We know very little of the likely targets of the succeeding Plans. Even the Second Plan period's targets were not final. In his statement on October 13, 1954, the then Irrigation and Power Minister, Government of India, indicated some long-range goals for development in the field. "Over a period of 15 years the general aim should be to double the irrigable area under multi-purpose large and medium projects and to increase power capacity from 2.3 million KW to 9.3 million K.W.". From this it is evident, as was stated above, that the programme adopted for the First Plan period was conceived as a stage in a programme extending over a much longer period in which each phase would merge into the next. Anyway, irrigation and power accounted for about 29 per cent of the outlay during the First Five Year Plan. It has been pointed out in our study that a large number of projects had been initiated before the First Plan commenced so that during the period of the Plan the emphasis was on large schemes. While projects estimated to cost less than Rs. 10 crores each accounted for about a third of the cost of the projects as a whole, the expenditure on them works to about 45 per cent of the estimated outlay during the Plan period. The total outlay on irrigation and power during the First Plan was Rs. 569 crores as against an initial allocation of Rs. 561 crores. By the completion of 1961 the irrigated area is expected to increase to 73 per cent more than that at 1951 and this will take us to 8.88 crore acres. The electricity plan for the next 10 years envisages an expansion of installed capacity by 20 per cent annually. All these speak of an ambitious programme of development for future.¹

But, what are the general trends in the sphere of river resources development in India? The foremost factor to note is that the concept of planning for river resources development has become an accepted fact. The tradition of piecemeal development of river resources is broken.

The second important trend is that though in the initial stage we did not actually possess Indian hands to meet the technical challenge, with the advancement of each year the challenge is becoming smaller in magnitude. To start our first giant project, the D.V.C., we had to lean heavily on foreign technicians. But in projects like the Bhakra-

¹ Statistics in these pages are drawn from First and Second Five Year Plans, chapters on Irrigation and Power, and *India*, 1957, pp. 276-287.

Nangal and Mayurakshi, Indian technicians proved their competence in meeting hitherto-unexperienced technical problems.

The third most important trend that we find in this field is a tendency to debate as to what type of Administration is best suited in planning our river resources. We started with the autonomous Corporation (D.V.C.) principle, experimented with Control Boards in Hirakud and Bhakra-Nangal, and, thirdly, Direct Control as in the Mayurakshi project. Even today no final verdict on the matter is available. The administrative set-up as a whole seems to be in an experimental stage. In the light of observed results, however, it appears that in the case of large multi-purpose projects, the case for the Corporation method of administration is rather strong.

In connection with the question of financing the projects, we find completely different practices. If the Damodar Valley Corporation has, at least constitutionally, the power to raise loans for construction purposes, the Hirakud or the Bhakra-Nangal did not have the same power. In most projects, direct financing practices were adhered to. In the case of inter-state projects we have already seen that there have been some bottlenecks in the regular payment of the respective shares and, more important, in proper time. Foreign exchange problems and the Centre's financial difficulties meant serious handicaps in the allocation of costs even in projects which fell within the boundaries of separate States. This apart, it is to be remembered that the flow of benefits of the river resource development plans depend to a great extent on the manner in which the irrigation and power programmes are distributed area-wise as between large and medium-sized projects. These twin problems of keeping a proper balance between the types of projects (large and medium) and between the different regions covered by river-basins, seem to have raised a number of problems. And, it appears that neither the Planning Commission nor the other governmental departments and agencies have realised the gravity of these all-important aspects of river basin planning, at least during the first five years of intended planned development of India. It is suggested, therefore, that more earnest attention is paid on these aspects of developmental planning.

The Planning Commission views with great concern certain leakages regarding expected benefits to be realised by the people. These leakages reveal an unwelcome trend. Recounting the experiences, the Review of First Five Year Plan says: "In some cases it has happened that owing to defective phasing of works, water has been stored at considerable cost which can irrigate large areas, but canal and distribution system needed for conveying the water to the fields were not ready in time. There were also projects in which time-table prepared by States for spreading the available irrigation facilities has not been rapid enough".¹ Thus, there are important lessons to be learnt from the experiences of the past few years. The *Second Five Year Plan* comments: "The phasing of irrigation and power projects

¹ *Review of First Five Year Plan*, G.O.I., 1957, p. 144., para 6.

should be carefully arranged to yield maximum returns from investment at each stage."¹ Perhaps this is a lesson learnt from the working of the First Plan. To elaborate this idea we should say that the planners did not seem to have the vision of proper economic development in the river valley regions.

The significance and importance of regional planning, though appreciated by the planners, still remain to be realised in actuality. What we find today on India's river front is a trend towards isolated attempts at economic development rather than an integrated improvement. Hence it is of paramount importance to rethink and reshape the planning activities in our river basins. The ways and means which are adopted broadly in the TVA may, with due allowances, be adapted to our river basin plans.

Still another important trend that we may note is the anxiety on the part of the planning authority for a rather hasty reimbursement of investment in our river projects. The First Five Year Plan emphatically states that "people in every area should feel that the project included in the plan is their own, intended for improvement of conditions in their area and that they should make special sacrifices for getting it completed."² The Plan further states: "Large schemes cannot be financed unless this principle is accepted and adequate levies are made towards the capital cost. It is estimated that a third or a fourth of the capital cost can be realised through betterment levies. The levy of betterment contribution in the form of land from larger holdings will also be useful."³ This proves that there had been an anxiety shared by the planners, when they laid the blueprint, on the score of speedy reimbursement. Reviewing the achievements of the First Plan, the *Review of the First Five Year Plan* states: "The formulation of detailed rules and criteria have tended to take time. As a result of this there were practically no collections of betterment fees during the First Plan".⁴ We may observe, however, that even if the rules were drafted in time, public opinion would have been against so speedy a reimbursement policy (i.e., much before the public actually reaped the benefits).

The problem of irrigation rates is not so paramount, because it is not a compulsory levy as such, in the sense that one has the option to take or not to take irrigation water. The Irrigation and Power Minister, Sri S. K. Patil, himself has stated that an "important factor that has caused delay or inadequate utilisations of irrigation facilities is the defective system of levying water rates which often fails to induce the cultivator to make use of the water made available at great cost. In this connection, it may be mentioned that a number of States are taking active steps to rationalise the water rates through

¹ *Second Five Year Plan, Chapter on Irrigation and Power*, p. 349.

² *The First Five Year Plan*, p. 368, para 91.

³ *Loc. cit.*

⁴ *Review of the First Five Year Plan*, para 6.

legislation". This suggestion and the steps taken in the light thereof are quite appropriate and helpful.

The ultimate success or failure of a big river resource development plan depends upon the inhabitants of the region concerned. It is they who are to convert the benefits flowing from the projects in terms of actually increased production. The public co-operation in the projects, as at present, lacks vitality and interest. The small experiments that were conducted in the Kosi Project area began with all enthusiasm, but it seems to have ebbed out in course of time. Educating the people for evincing active interest and co-operation in the nation's economic development is an item which, to all intents and purposes, appears to have been either forgotten or sidetracked during the progress of the First Plan and also, so far, during the first three years of the Second Plan. It seems that the planners took public co-operation for granted, as if it already did exist! This is the limitation, to say the least, of planning from top.

And, finally, the development of river resources should not be mistaken as the equivalent of mere building of dams, irrigation canals, extension of electricity facilities, etc. It means much more. New housing schemes, rehabilitation of uprooted villagers, sanitation, drainage, soil conservation, improved agriculture, demonstration farms, research centres in soil sciences, animal husbandry centres and a host of allied functions which actually concern the life of the people of a riverine region, are to be provided for simultaneously. If these facilities are non-existent or are late in appearing, or too scanty to cope with actual requirements, we are sure to lose the battle against the existing miasma of poverty and hunger. And we shall lose, too, the battle against what is called "population explosion" in the coming years.

Obviously, many new problems have cropped up in the course of India's river valley development. We may recall that the nature and tempo of our projects during the plan period is unprecedented. More money has been and is being spent in each year of the two plans than the total investment of 120 crores in the capital cost of all the river valley works in the last hundred years of British Rule in India. As such, the Planners have had to face some problems in a big way, and naturally there are mistakes, loopholes and shortfalls.

For example, in nearly all cases the target dates for completion were not adhered to. Delays are explained away as due to unavoidable or unforeseen circumstances. It can also be pointed out that there is not much evidence in the public sector of properly planned and scientifically devised incentives which will induce the workers to give their best. Still another drawback is that since the technical and administrative aspects of any big project are linked inextricably, by splitting the authority and responsibility for decision only the quality of work is undermined. If the engineer and the administrator disagree, a huge damage to the whole cause becomes inevitable. The

result is a number of inquiry committees and some sort of recrimination which hamstring the entire organisation and slow down its tempo. Meanwhile the job itself receives a setback which takes months and years to make up.

A very important role in the organisation of projects is that of finance. The usual financial policy in India is not the business-like scrutiny of expenditure but the hairsplitting approach of checking whether every letter of the rules has been complied with. The result is that *the engineer does not get the ideal financial climate which is so very necessary for the completion of the job.*

A considerable amount of money and materials has also been wasted by wrong planning and careless management and supervision. The P. S. Rau Committee which enquired into the working of the D.V.C. came to the conclusion that mismanagement in the operation of the Konar project alone has resulted in a loss of Rs. 1.64 crores. The Report said, "owing to the absence of competent technical advice there was no proper appreciation of the magnitude of the problem involved in the construction of the project". Little wonder, therefore, that the Corporation failed to pay sufficient attention to the planning of equipment in the early stages. Overall planning according to the Report was made impossible by frequent and numerous changes in design and programme. In a work of such magnitude as irrigation and power projects (or river valley projects) some loss of money was inevitable in view of the inexperience of the officials and mistakes which were bound to be made under such conditions. But it seems that the actual losses have been much greater than should have been expected and care will have to be taken in future to prevent unnecessary loss of public money.

Another huge socio-economic problem that the river planners had to face was *the resettling of displaced population from project sites.* It was experienced in all projects without exception that the inhabitants of the project sites which were to be submerged under waters to be stored up were unwilling to leave their homes and soil to which they were intimately attached for generations together. Unwittingly or otherwise it appears that the requisite sympathy and understanding could not be showed in tackling this essentially human problem. This was perhaps better done in the D.V.C. and Hirakud areas. The problem has two main aspects: one is the conservatism and lack of knowledge of the kind of sacrifices involved in resource conservation to be borne by the people. The other is the inability of the administrators and engineers to appreciate and respect the sentiments of the inhabitants of the project sites who generally are innocent rural folk. The executives and planners at least in the initial stages tended to think that payment of compensation in the form of cash or land would be adequate for covering the social costs borne by the people concerned. It is gratifying to note that this problem is receiving increasing attention of the authorities concerned.

With all the existing drawbacks, however, the achievements and progress registered so far in the sphere of India's river resources planning should not be minimised in a light-hearted manner. Regarding the success or failure, we cannot afford to be dogmatic one way or the other. Considering the staggeringly large number of projects that have already been taken up throughout the length and breadth of the country and their purposeful implementation, the planners and the field operators deserve a word of praise and cheer. Mistakes and pitfalls are undoubtedly there, but we learn through our mistakes and we go forward drawing upon our accumulated experiences. India's present mistakes are doubtless equipping her better for more perfect programming for the future. If everything goes all right and as the country's river resources are more fully harnessed and project benefits — large, medium and small — are increasingly appropriated in the interest of higher productivity and welfare of the masses in the next fifteen years or so, an all-important corner-stone of her economic prosperity will have been firmly laid. And that surely will be one of the many ways to ensure the future of democracy in India.

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112 ECONOMICS OF RIVER BASIN DEVELOPMENT IN INDIA

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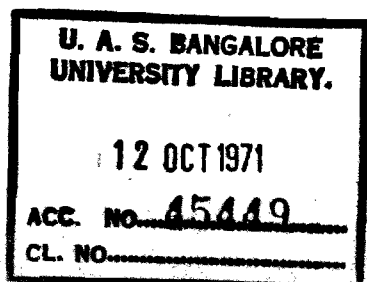
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INDEX

Authors

Appleby, Paul H., 96, 96*n*, 115
 Beard, George L., 89*n*, 115
 Bogart, Ernest, 115
 Bolton, D. J., 78, 78*n*, 114
 Brown, Phelps, 114
 Buckley, and Lund, 111
 Buckley, Robert, 57*n*
 Butterick, John A., 28*n*, 111
 Bye, and Hewett, 114
 Chandler, 83, 83*n*
 Clapp, Gordon, 3*n*, 100
 Cochran, A. L., 82, 82*n*, 115
 Constanzo, G., 56*n*, 113
 Foster, E.E., 83*n*, 115
 Gadgil, D. R., 56*n*, 72
 Ganguli, B. N., 72, 73
 Ghosh, Alak, 71*n*, 114
 Golze, Alfred, 8*n*, 110, 111, 112
 Gorwala, A. D., 95*n*, 115
 Grant, Eugene L., 112
 Hart, Henry C., 71*n*, 90, 90*n*, 114, 115
 Hewett, and Bye, 114
 Hussain, Akhtar, 1*n*
 Huxley, Julian, 2*n*, 5, 76*n*, 114
 Ise, John, 37*n*, 112
 Joss, Alexander, 64, 64*n*, 114
 Khosla, A. N., 69
 Krishnamachari, V. T., 29
 Krishnamurthy, S., 72
 Kumarappa, J. C., 29, 30*n*, 112
 Lillienthal, David, 3, 3*n*, 100, 110
 Lund and Buckley, 111
 Marshall, Alfred, 37, 37*n*, 112
 Mathai, John, 48
 Mazumdar, 66*n*, 68
 Mehta, 52*n*, 113
 Moore, Henry Estill, 110
 Morgan, Arthur E., 91, 100
 Mukerji, Karuna Moy, 3*n*, 9*n*, 39*n*, 110, 111, 112, 113
 Nehru, Jawaharlal, 47
 Niyogi, K. C., 4*n*, 110
 Odum, Howard W., 110
 Parthasarathy, C. S., 98*n*, 115
 Patil, S. K., 106

Pigou, A. C., 58*n*
 Pritchett, Herman, 94*n*
 Rao, G. V., 113
 Rao, S. Srinivasa, 114
 Rau, P. S., 95, 95*n*, 115
 Ray, Kamalesh, 115
 Robson, William A., 93, 93*n*, 97*n*, 115
 Roosevelt, 2, 2*n*
 Sain, Kanwar, 3*n*, 110
 Sen, Sudhir, 4*n*, 13*n*, 102*n*, 111, 116
 Straus, Michael W., 25*n*
 Subrahmanyam, C., 73
 Taussig, T. W., 58, 58*n*, 114
 Thompson, A. N., 22
 Thompson, Percy, 46
 Uthwatt, 58, 58*n*, 114
 Wantrup, Ciriacy, 22*n*, 25*n*, 112
 Williamson, Harold F., 111

Rivers/River Projects

Amazon, 3
 Aswan dam, 35
 Bhakra, 15, 101, 104
 Bokaro, 17
 Chambal, 101
 Colorado, 7
 Damodar, 6*n*, 32, 90
 Ganges, 3, 89
 Hirakud, 15, 66, 66*n*, 90, 96, 99, 99*n*, 100, 105, 108
 Indus, 89
 Konar, 17, 108
 Kosi project, 35, 96, 107
 Krishna-Pennar project, 69, 70
 Machkund, 101
 Mahanadi 89, 90
 Mayurakshi, 17, 71, 105
 Missouri, 75
 Nangal, 32, 105
 Nile, 3
 Ob, 3
 Parana, 3
 Tungabhadra Project, 7, 70, 101
 T. V. A., 1*n*, 2, 3, 3*n*, 5 6*n*, 8, 76, 89, 90*ff*, 102
 Yangtze, 3
 Yellow River, 3
 Yume Project, 20, 21, 21*n*

Subject**A**

- Ability to pay, 40, 41, 42, 69, 73
- Administration, 4, 15
 - River valley projects, of, 89-102
 - patterns, 89
 - problems, 89
- Agricultural, 3
 - economist, 4
 - labour, 5
 - production, 32
 - programme, 9
- Agriculture, 1*n*, 5
 - Indian, 1*n*, 31
- "Alternative-Justifiable-Expenditure Method," 34-35
- Amortisation, 28, 41
- Assessment, 39, 40

B

- Basin (See River basin)
- Benefits, 18, 19, 20, 21, 22, 24, 27, 28, 30, 32, 58-59, 70-71
 - annual, 19
 - direct, 20, 25
 - indirect, 20, 24, 25, 29, 32
 - induced, 23
 - intangible, 20, 23, 26
 - measurement of, 23, 28, 33
 - primary, 20, 25, 26, 42
 - private, 39, 42
 - public, 39
 - secondary, 20, 25, 26, 32, 42
 - social, 29, 30, 31, 33
 - tangible, 23
- Benefit-Cost Analysis, 18-28, 39, 40
 - approach, in India, 28-33
 - radio, 19, 22, 23
 - relationship, 20
- "Benefits Method", 36
- Bengal famine, 3
- Betterment:
 - assessment of, in U.K., 58
 - in U.S.A., 57-8
 - estimating, 62
 - meaning of, 55-57
 - period of realisation of, 72
- Betterment Levy, 5, 5*n*, 40, 40*n*, 47, 57*ff*
 - as source of revenue, 69
 - Bhoddan, and, 65
 - economic growth, and, 71
 - landowners, and, 66
 - laws on, in India, 60*ff*
 - Mazumdar Committee on, 66-9
 - methods of determination of, 66-9
 - period of payment of, 70, 71
 - principle of realisation of, 72
 - quantum of, 63, in India, 64*ff*, U.K., 63-4, U.S.A., 64

- Betterment Levy:
 - revised settlement-cum - 73-4
 - timing of collection of, 65
 - yardstick for, 59
- Board (See Control Board)
- Bond-issuing, 9, 10
- Boom, 11
- Borrow, 9
- Budget, 10, 11
- Bunding, 5
- Buffer-stock, 32
- Bureau of Reclamation (U.S.), 2, 18, 19, 22, 25*n*, 35, 40*n*, 64, 71, 78*n*

C

- Capital, 4, 9
 - formation, 4, 7, 28*n*
 - investment, 4, 14, 28
 - market, 31
 - outlay, 4, 16
- Capitalised, 37
- Catchment, 4, 5
- Colombo Plan, 16, 17
- Colonisation, 5
- Compensation, 5
- Compensatory spending, 6
- Conservation, 1, 2, 3, 6, 18, 38, 88
 - resource, 1
 - soil, 4, 16
- Construction Cooperatives, 100-101
- Control Board, 10, 10*n*, 11, 12, 90, 98-100, 101
- Corporation, 10, 11, 12, 13, 14, 90-98, 100, 101, 102
- Corps of Engineers, 2, 18
- Cost allocation, principles of, 33-38
 - methods, 34-38
- Costs, 15, 18, 19, 20, 21, 24, 27, 28
 - annual, 19, 21
 - associated, 20, 26, 58
 - capital, 22
 - direct, 33, 38
 - fixed, 37
 - indirect, 20
 - intangible, 18, 20, 23, 26
- Costs:
 - investment, 27
 - joint (see joint)
 - joint facilities, of, 33, 36, 38

- marginal, 58, 59, 76, 77
 - measurement of, 23, 28, 30, 33
 - opportunity, 31
 - overhead, 34, 78
 - primary, 26
 - project, 20, 26, 27, 34
 - reimbursible, 18
 - secondary, 20, 25, 26
 - social, 30, 31, 72
 - separable, 34
 - tangible, 18, 23
 - total, 33
 - variable, 37
 - variety of, 23
- D
- Dam, 4, 17
 - Damodar:
 - river, 17
 - valley, 6*n*
 - valley corporation, 11*n*, 12, 90-105 *passim*
 - valley project, 7, 8, 29, 30
 - Debt, 9
 - Defence, national, 24, 40
 - Deficit: financing, 15
 - spending, 6
 - Democracy, 8, 109
 - Depreciation, 22
 - Depression, Great, 2
 - Desert, 4
 - Devaluation, 17
 - Development, 1, 2, 3, 4, 9, 16, 102
 - Colorado river valley, 7
 - Damodar valley, 16
 - economic, 1, 2, 28*n*
 - integrated, 5, 6, 8
 - irrigation, 25, 39
 - land, 4*n*
 - Development:
 - maximum, 1
 - multi-directional, 7
 - multi-purpose, 3, 4
 - national, 2
 - planned, 1
 - planned economic, 2
 - problem of, 7
 - programme, 33
 - programming of, river valley, 7
 - projects, 7, 28*n*
 - public resource, 25
 - purposes of, river valley, 6
 - regional, 2
 - river basin, 18, 34, 83, 88
 - river resources, trends in, 104-109
 - river valley, 3*n*, 6, 7, 10, 20
 - criterion for, 23
 - motives of, 7
 - objectives of, 6
 - Tennessee Valley, 7
 - Unified, 28
 - Urban, 2
 - Valley, 2, 4, 5, 6, 19
 - Water resource, 10, 24
 - Waterways, 16
 - Displaced population, resettling, 108
 - Dollar shortage, 17
 - Domestic Water Supply, 32, 40, 41
 - (Also see Water Supply)
 - Drainage, 5
 - D. V. C., 8, 12, 13, 14, 15, 17, 17*n*, 90-108 *passim*
 - D. V. C. Act, 12, 13, 15, 90-95 *passim*
 - D. V. C. Enquiry Committee, 95, 97, 97*n*, 108
 - Dynamic, 2
- E
- E.C.A.F.E., 97
 - Economic, 1, 2, 4, 5
 - activity, 5
 - criterion, 20
 - democracy, 8
 - development (see development)
 - value of, 59
 - evaluation, 18, 33
 - feasibility, 18, 19
 - gain, 4
 - growth, 33, 71
 - instability, 33
 - institutions, 7
 - justification, 21
 - opportunity, 1, 2
 - stability, 24
 - Economics, 1*n*, 4
 - flood control, of (see Flood Control)
 - land development, of, (see Land)
 - managerial, 4
 - meta, 24
 - watrr resources development, of, 20*n*
 - Economies:
 - capitalistic, 30
 - communist, 30
 - developed, 32
 - external, 7
 - socialist, 30
 - Electricity (see Power)
 - "Equal-Apportionment Method", 36-7
 - Erosion, 4
 - External: assistance, 16*ff*
 - economics, 7
- F
- Famine, 3, 3*n*
 - Bengal, 3, 3*n*

- Farm, 4, 5
 - demonstration, 5
- Fees, 39, 40
- Field channels, 5
- Finance, 11
 - allocated, 17
 - apportionment of, 11
 - availability of, 17
 - burden of, 11
 - indirect, 13
 - Mayurakshi River project, of, 17
 - share of, 11
- Financing, 7
 - by external agencies, 8
 - development projects, 8
 - D. V. C., 12ff
 - private enterprise projects, 11
 - river projects, 7-18, 105, 108
 - in India, 11ff
 - means of, 10
 - methods of, 9ff
 - problems of, 10ff
- Five Year Plan:
 - First, 12n, 15, 16, 29, 47, 47n, 53, 60n, 61, 69, 73, 106
 - evaluation of, 102-104
 - review of, 105, 105n
 - Indian, 15
 - Second, 16, 16n, 17, 17n, 31, 53, 65, 73, 103, 105, 106
 - Third, 16
- Flood, 3n, 32
- Flood Control, 3n, 9, 16, 26, 32, 33
 - as problem of applied economics, 81

- benefit-cost approach in, 84ff
- benefits of, 59, 81ff
- costs of, 83, 84ff
- economics of, 26n, 81-89
- factors of, 83
- financing, 88-9
- losses, 81ff
- payment for, 88-9
- projects, evaluating, 83ff
- protection, 23

- Food, 3
- Foreign Exchange, 15, 16, 17, 31
- Forestry, 4, 9

G

- Gandhian, 30
- Growth, economic, 33, 71

H

- Hard Currency, 17
- Himalayas, 6
- Holdings, 5
- Hungry, 3
- Hydro-electricity (see Power)

I

- I.B.R.D., 16, 17, 17n
- Income, distribution of, 7
 - per capita, 59
- Induced, 25, 32
- Industries, 4, 5, 26
- Intangibles, 18ff
- Interest, 9, 12, 22, 26, 27, 28, 31, 37, 41, 51, 76, 89
- Investment, 4, 6, 10, 28
 - alternative, 18
 - costs, 28
 - criterion, 18
 - farm, 26
 - level of, 28
 - lump, 7
- Irrigation, 1n, 3, 4, 6, 8, 12, 15, 16, 17, 23, 25, 26, 29, 32, 34, 35
 - canals, 4, 29
 - cess, 40
 - charges, 42
 - in America, 43
 - in Egypt, 43
 - in India, 43-55
 - proper, 43
 - rates, 40, 41, 42-55
 - Mehta Committee on, 52n
 - reimbursement, 29
- Irrigation Commission, Indian, 44, 50
- Irrigation Development Fund, 12
- Irrigation works, classification of, 43ff, 50

J

- Joint construction (see Construction Co-op.)
- Joint costs, 34, 35, 37, 41, 58
- Joint facilities, 33, 36, 38
- Joint products, 37
- Joint supply, 58

L

- Land:
 - betterment, 40, 57
 - capital value of, 63
 - ceiling price of, 72
 - development, 4
 - improvement, 40
 - market rate of, 63
 - owners, marginal, 59
 - price of, 62
 - scarcity, 40
 - surrendering, 72
 - taxes, 69, 74
 - tenure & betterment levy, 70
 - values, 39, 58, 61, 62, 63
 - speculation in, 59-60

- Least alternative means, 26
- Loan-raising, 10
- Loans, 9, 22
 - foreign, 22
- M
- Marginal cost (see Cost)
 - utility, 59
- Market, 24, 25, 32
 - price, 25, 26, 37
 - value, 26
- Meta economics, 24
- Mixed farming, 5
- Multiple benefits, 6
 - purpose, 33
- Multi-purpose, 2*n*, 3, 4, 6*n*, 41
 - dam, 4, 17
 - development, 3, 4
 - projects, 2*n*, 3, 6*n*, 15, 22, 33, 36, 39
 - river basin development of, 16
 - (Also see Development)
 - river valley authority, 10
 - river valley projects, 7
- N
- Natural: region, 2
 - resources, 2, 3
- Nature, 1, rhythm of, 1
- Navigation, 4, 16, 35, 42
- Net assets, determining, 62, 62*n*
- Normal prices (see Prices)
- O
- Open market, 38
- Opportunity Cost, 31, 75
- Overhead (see Costs)
- P
- Panchayat, 51
- Parliament, 9, 10, 98
- Perfect competition, 37
- Plan (See Five Year Plan)
- Planning, 1, 2, 2*n*, 3, 4,
 - Commission, Indian, 12, 29, 47, 60, 61, 71, 72, 73, 98*n*, 105
 - economic, 1
 - Indian National, Committee, 1*n*, 47, 47*n*, 89, 89*n*
 - philosophy of, 30
 - regional, 1, 2, 3, 106
 - resource, 1
- Population, 1, 3
 - explosion, 107
 - transfer, 5
- Power, 3, 4, 5, 10, 12, 15, 18, 26, 33, 34, 35, 42
 - electric, 30, 53
 - base of rate-making of, 74*ff*
 - hydro-electric, 6, 17, 32, 35
 - cost of, 78
 - pricing of, 78
 - rates for, 74*ff*
 - cost principle, 74, 76, 78
 - marginal cost, 76-7
 - price function in, 80
 - value-of-service, 77-8
 - market survey for, 75
 - low-cost, 4, 26
 - projects, 15, 16
 - tariff types for, 78-80
 - water, 6
- Preference systems, 24
- Price, differentials, 25
 - effects, 26
 - ex-ante*, 27
 - levels, 26, 27
 - market, 25, 26, 37
 - normal, 37
 - system, 24
- Priorities, 11, 35, (see also Project)
- "Priority-of-Use Method", 35
- Private enterprise, 8, 11
 - in power production, 8
 - in river projects, 8
 - initiative, 7
 - projects, financing of, 11
- Profitability, 18
- Project, 2, 2*n*, 3, 4, 6, 6*n*, 10
 - evaluation of, 18
 - feasibility of, 18
 - formulation of, 18
- Project: multipurpose, 2*n*, 3, 6*n*, 15
 - multipurpose river, 11
 - priorities, criteria for, 39
 - reclamation, 8
 - river, 4, 5, 7
 - river valley, 6, 15
 - selection, 24, 26, 29
 - service, 34
- Public undertaking, 7
- Pump-priming, 6
- R
- Rau Committee, 95, 97, 108
- Reclamation, 8, 8*n*, 18 19*n*, 20*n*, 38
- Recreation, 4, 24, 26
- Regions, 1, low-income, 6
- Regional, authority, 9
 - balance, 1, 2
 - ism, 1
 - planning, 1, 2, 3, 5
- Repayment base, 25
- Reservoir, 2, 22, 23
- Resource, 1, 2, 5, 6
 - allocation, 11
 - budget, 11
 - conservation, 1, 25*n*

- development, 18, 23
- exploitation, 1
- planning, 1, 2
- project, evaluation of, 23
- use, 6
- utilisation, 1
- Risk, 27
- River basin, 2, 4, 5, 16, 19
 - development, 3, 4, 18
 - management, 23
 - planning, 34*n*
 - project, 34*n*, 38
- River: planning, 7, 8, 12, 41
 - plans, 11
 - project, 4, 5, 7
 - resources, 4, 8
 - training, 1*n*, 4*n*
 - valley authority, 9, 10
 - valleys, 2, 4, 5, 6, 7
- Reimbursement, 31, 34, 36, 38, 55, 71, 73
 - betterment levy, and, 65
 - period of, 41
 - policy, 39
 - problems of, 38-42, 53
 - programme accounts, 41
- Reimbursable, 39
 - costs, 18
- S**
- Sarvodaya, 30, 30*n*
- Silt, 4, 22
- Single-purpose, 11, 15, 22, 33, 34, 38, 39, 41
- Sinking Fund, 22, 28
- Slump, 11
- Social benefit (see Benefit)
- Social Cost (see Cost)
- Social framework, 30
- Social product, 19
- Socio-economic, 3*n*, 4, 6
 - problems, 7
 - purpose, 6
 - survey, 3*n*, 4
- Soft Currency, 17
- Soil conservation (see Conservation)
- Spending, 6, compensatory, 6
 - deficit, 6
- Standard, 3, economic, 8
 - living, of, 3
 - well-being, of, 3
- Starvation, 3
- State sector, 8
- Static, 23
- Sterling balances, 15
- Structural changes, 7
- Subsidy, 31, 32
- Subsoil, 5
- Surcharge, 73
- Surplus, 40, 71, 73
- T**
- Tangible, 18 *ff*
- Tax losses, 41
- Tax revenues, 9
- Taxation, incidence, 59
 - progressive, 72
 - surplus, of, 73
- Taxation Enquiry, Indian, Committee, 43*n*, 44, 45, 45*n*, 46, 50
- Commission, 48, 48*n*, 50, 51*n*, 61*n*
- Tenancy legislation, 63
- Tenure, 5, rights, 5
- Tennessee Valley Authority, 2, 6, 6*n*
 - Development, 7
- Terracing, 5
- Time, element of, 31
- Transport, 4
- Transportation, 9, 33, 44
- U**
- Uncertainty, 31, 32
- Underdeveloped, 2, 6
 - area, 2, 6
 - country, 7, 8, 22*n*, 33, 41, 59, 80
- Underemployed, 31
- Underemployment, 30, 31
- Unemployed, 30, 31
- Unemployment, 30, 31, "Use-of-Facilities Method", 36
- Utilisation, 1, water, of, 6
 - water resources, of, 3*n*
- Utilities, 8
- V**
- Vegetation, 1
- "Vendibility Method", 37
- W**
- Water resource (see Development)
- Water Supply, 42
 - domestic (see Domestic)
 - industrial, 40, 41
 - rates, 74
- Welfare, 7, 9, 11, 24, 30, 32, 40, 42, 71
- "What the traffic will bear", 74
- Windfall gains, 40
- World War II, 15
- Y**
- Yardstick, 30, 54, 59

CORRIGENDA

Page	Line	Read	For
7	27	external economies	external economics
8	1 <i>n</i>	Alfred Golze	Alfred Golz
18	28		—
23	10	estimates of benefits	estimates or benefits
33	25	A. E. Morgan	H. A. Morgan
62	21	Calculated	collected
62	38	Sum	Same

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